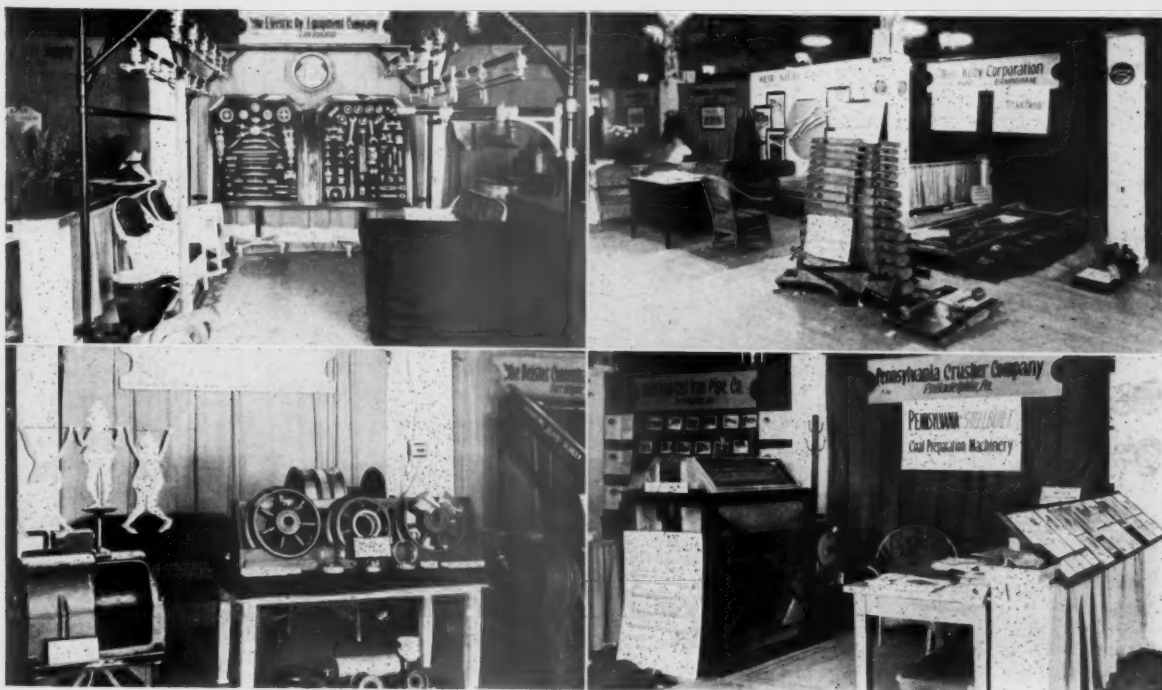
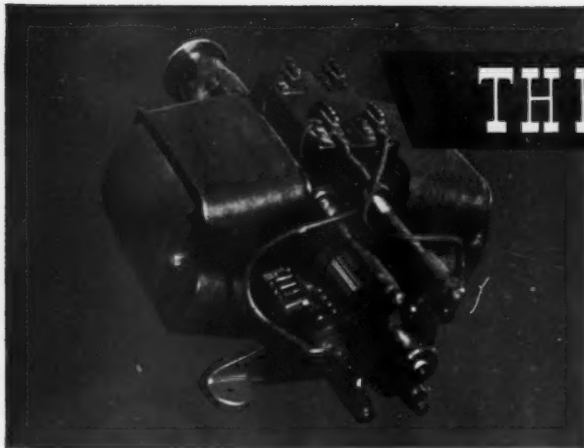


# *The* MINING CONGRESS *JOURNAL*



## **ELEVENTH ANNUAL COAL CONVENTION *and* EXPOSITION**



# THEN



**I**N 1883 a patent was issued on the use of carbon for dynamo and motor brushes. Carbon brushes were not manufactured at that time. However, carbon brushes proved so much better than metal that any kind of carbon available was soon being applied. Carbon battery plates were frequently used for brushes and even street lighting carbons, as on the little motor illustrated.

# ..and



# NOW

Fifty years have seen striking changes. Current density in brushes doubled and trebled. Commutator surface speeds raised to more than a mile a minute. Commutator wear practically eliminated. Alternating current introducing new commutation problems. "A Carbon Brush" no longer sufficed. Many grades were required to meet all the varied conditions encountered in brush application.

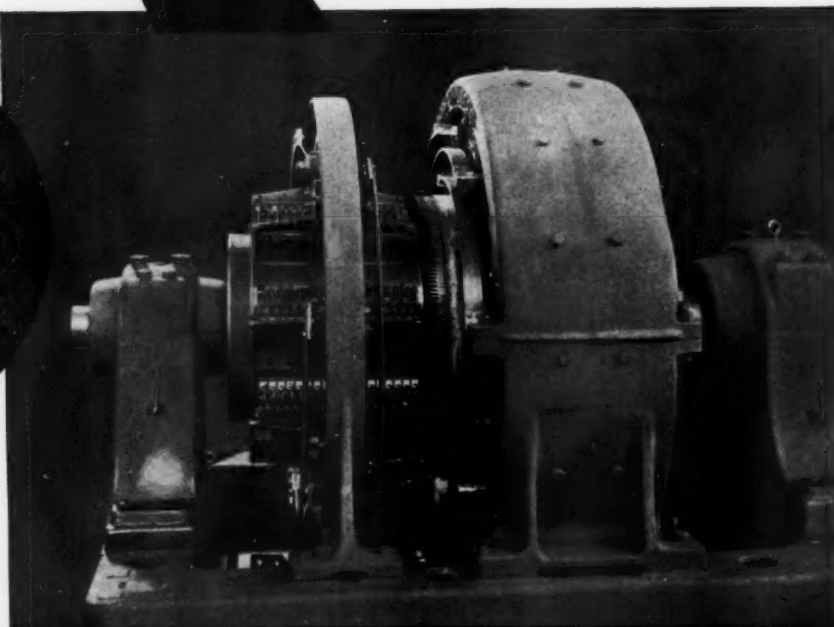
National Carbon Company pioneered in brush manufacture and development, keeping pace with each stage of progress in electrical design.



set the standard of brush performance today. Their characteristics are determined by careful analysis of service requirements.

Uniformity is maintained by close control at every stage of production.

**THERE IS A  
NATIONAL PYRAMID  
BRUSH FOR EVERY  
TYPE OF SERVICE**



## NATIONAL CARBON COMPANY, INC.

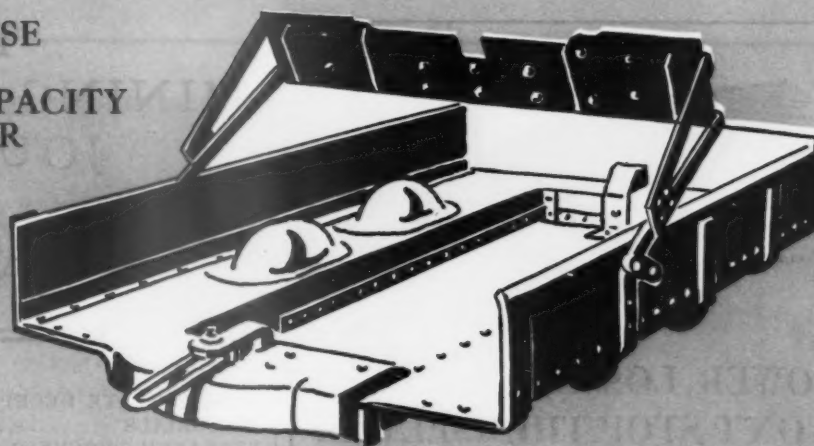
Carbon Sales Division, Cleveland, Ohio

Unit of Union Carbide and Carbon Corporation

Branch Sales Offices • New York • Pittsburgh • Chicago • San Francisco



**ENTERPRISE  
4-AXLE  
MAXIMUM CAPACITY  
MINE CAR**



**9 Years of Successful Service . . . . .**  
*prove the value of this Enterprise design*

The four-axle mine car was pioneered and developed by Enterprise—advertised in 1925—and exhibited the same year at the Mining Congress Show in Cincinnati.

Well received by Coal Operators at that time it has gained steadily in popularity ever since; and is now widely used in mines where the greatest possible capacity is desired for any given overall dimensions. Experience has shown that the use of this design gives from 15 to 35 percent greater capacity than conventional designs without increasing height, width or length. Other outstanding advantages are its sturdy construction and greater trackability because of the four floating axles.

Although every Enterprise mine car is especially engineered to meet the particular conditions of the mine in which it is to be used, we recommend careful

consideration of this four-axle type for any mine in which height is the limiting consideration. Greater capacity usually means greater production, lower haulage costs, and higher net profits.

**Enterprise Solid Roller Bearing Wheels**—are made from semi-steel, heat-treated to develop high tensile strength; and chilled to give long life without appreciable wear. Every Enterprise Solid Roller Bearing Wheel is guaranteed for five years satisfactory service under normal mining conditions.

**Other Bearings**—In cooperation with Factory Engineers we have adapted this wear-resisting long-lived semi-steel casting to use Timken and Tyson Tapered Roller Bearings, or Ball Bearings, when desired.

**Other Enterprise Products**—Include Sheaves, Conveyor Buttons, Hitchings, Couplings and Rail Benders. Let us have your inquiries.

*Visit Booth 168 at the Cincinnati Show where a car of the type pictured above will be exhibited.*

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CORPORATION**

**BRISTOL, VA.—TENN.**

**HUNTINGTON, W. VA.**

Type  
A-2H  
Bond



## POWER LOSSES WON'T STOP THEMSELVES!

But you can stop one source of loss by regular bond inspections.

The drop of water from a faucet isn't much—but it costs money—one poor bond doesn't seem like much but it represents a complete loss of the money invested in labor and material as well as the continuous power loss.

Notice the wide welding vee in the steel arc weld bond pictured above. Bonders find it easy to get a good sound bead of weld metal all around the terminal. See how every wire end is exposed to the arc in the copper arc weld bond below. Both types of bonds can be counted on to put your track return circuit at its best efficiency.

A complete display of arc weld bonds, welding rods and bonding rheostats will be shown at the Cincinnati Coal Show, booth No. 51.

## THE ELECTRIC RAILWAY IMPROVEMENT CO.

2070 E. 61 Place

CLEVELAND, OHIO

Type CAEH  
Bond



# THE MINING CONGRESS JOURNAL

MAY  
1934



VOLUME 20  
NUMBER 5

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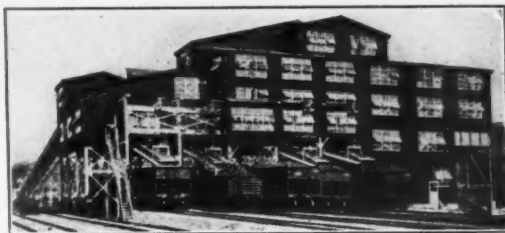
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A 450 T.P.H. COAL PREPARATION PLANT  
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THE 550 T.P.H. SAND FLOTATION PLANT OF  
THE ACME COAL CLEANING CO. AT  
AVELLA, PA., COMPLETED IN 1933



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We now have the sole American rights for the sale and construction of  
**CHANCE Sand Flotation Plants for Bituminous Coal—**

*“the ONLY EXACT METHOD of cleaning coal”*

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but a *better* man with his  
**M·S·A**

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anytime . . .

*Reading from Head to Foot*

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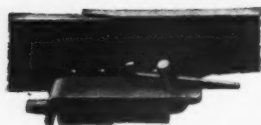
MSA EYE PROTECTORS

MSA FLAME SAFETY LAMP

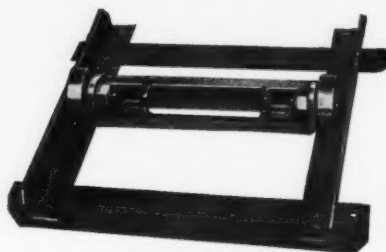
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MSA SAFETY SHOES

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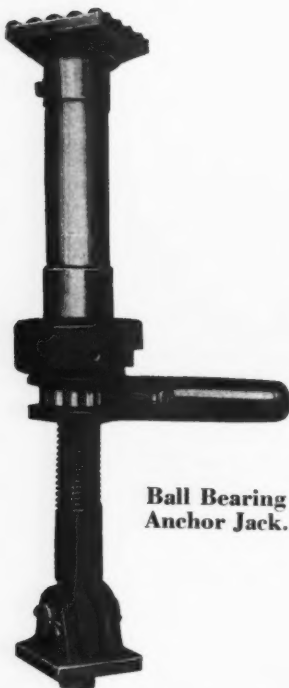
Mac Hatson  
Trough Fastener.



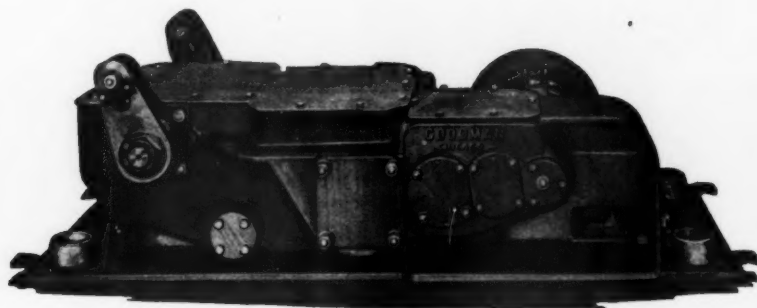
UNIVERSAL  
Silent Ball Bearing Trough Support.



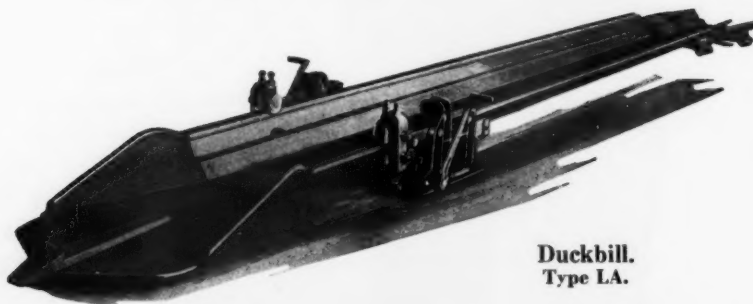
Angle Trough.  
(90° or less)



Ball Bearing  
Anchor Jack.



UNIVERSAL  
Shaker Conveyor Drive. Type G-20.



Duckbill.  
Type LA.



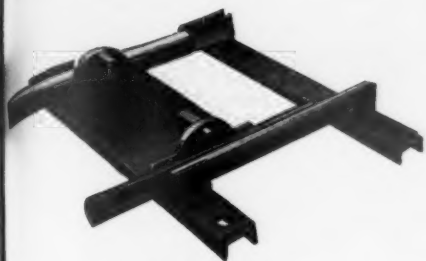
Connecting Trough. Type Uof-10. Fully Reinforced.

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COMPANY  
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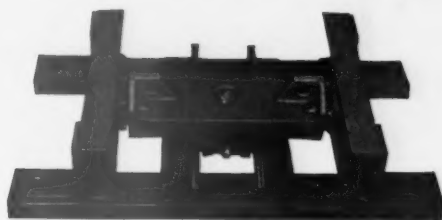
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# Shaker Conveyor Equipment



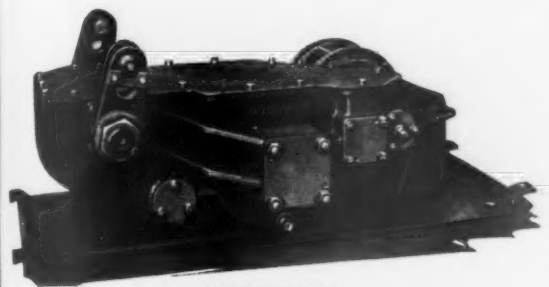
Guide Frame.  
(Light)



Guide Frame.  
(Heavy)



Cosco  
Speed Link.



UNIVERSAL  
Shaker Conveyor Drive.  
Type G-15.



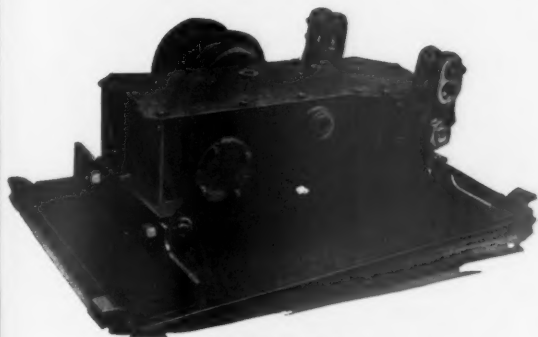
Pony Truck.



Swivel Trough.



Pipe Jack  
and  
Pendulum.



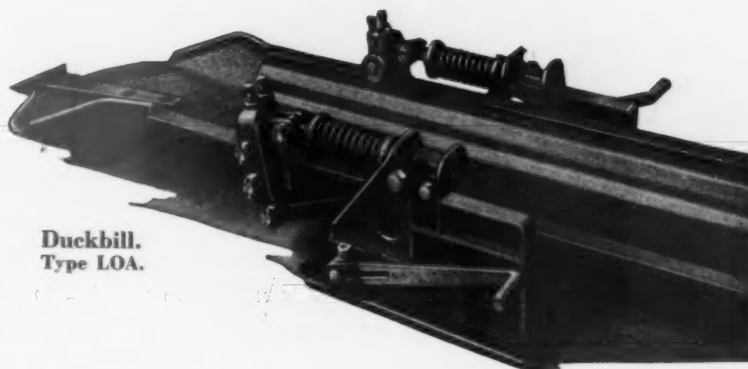
Little Giant Drive.  
Type E-10.



Ball Joint Puller Rod.



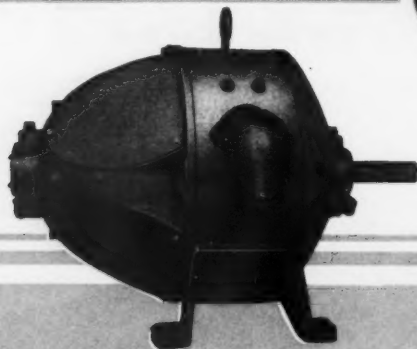
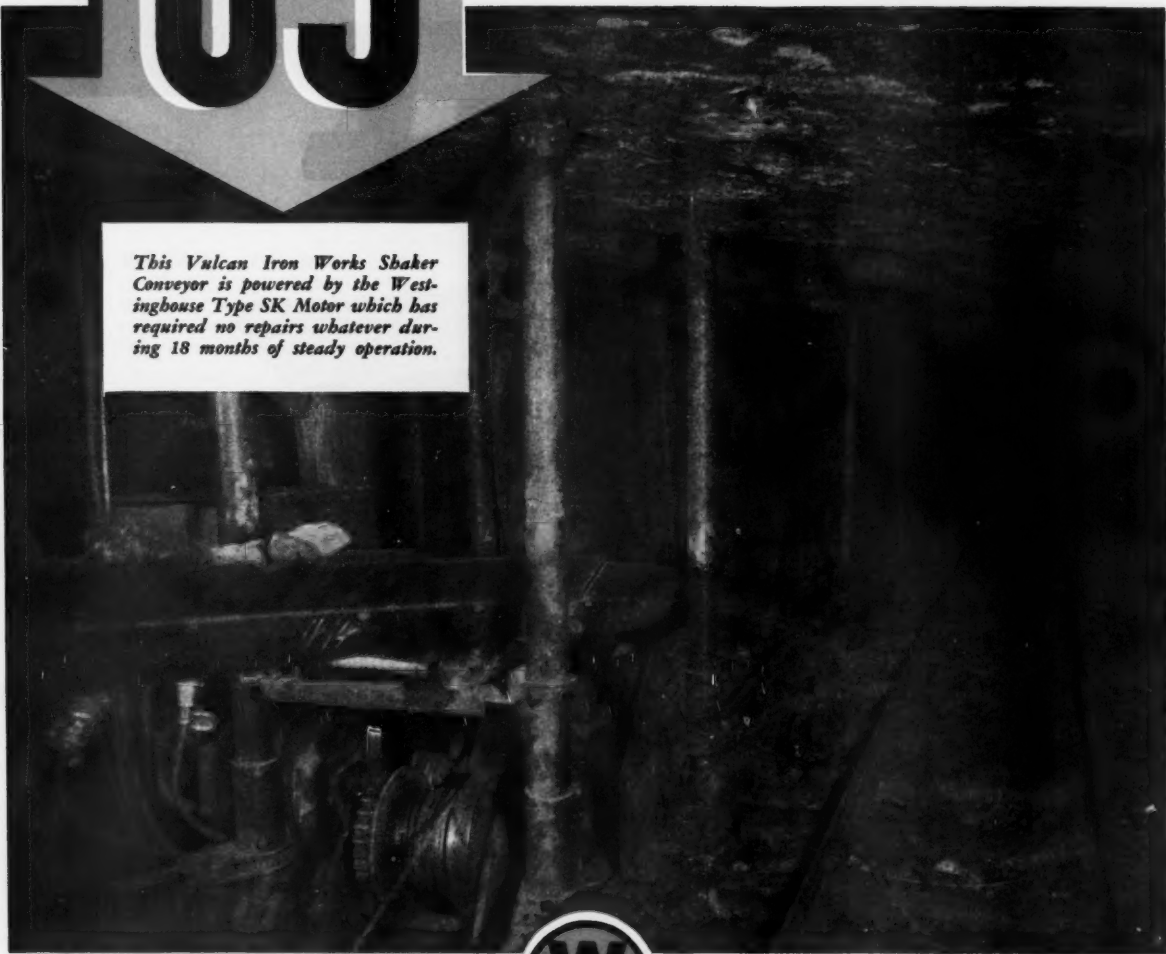
Troughing  
of all  
Sizes.



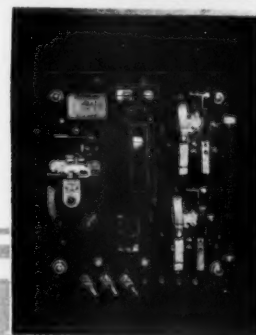
Duckbill.  
Type LOA.

# 65 OPERATIONS

*This Vulcan Iron Works Shaker Conveyor is powered by the Westinghouse Type SK Motor which has required no repairs whatever during 18 months of steady operation.*



*The Westinghouse Type SK Shaker Conveyor Motor. Insulated with specially prepared Mica, it easily withstands high temperatures caused by peak loads, moisture absorbed while cooling off between shifts, and heavy dust.*



*The Westinghouse Timestarter (cover removed) assures positive starting on partial voltage, low maintenance with the Cold-Arc Contactor, increased safety and few power interruptions. See it in operation at the Convention.*

# PER MINUTE FOR 18 MONTHS

*with this Westinghouse Shaker-Conveyor Motor*

**AND NOT ONE CENT FOR REPAIRS**

● SIXTY-FIVE operations per minute, 10 hours per day for 18 months, *with not one cent for repairs*... that's the record to date of a Westinghouse SK Motor powering a shaker conveyor installed in a large Pennsylvania anthracite mine.

In less than a second...the motor, controlled by a Westinghouse Timestarter, speeds up to 1000 rpm. and slows down again to 400 rpm. ...driving the conveyor which carries anthracite and rock up the gangway. At points the conveyor moves up grades with as high as 16 per cent slope.

Throughout the entire 18 months, performing this severe cycle more than 15,000,000 times, this motor has operated with complete satisfaction. *Not even a brush renewal has been made.*

With 20 of these units in service, the operator reports substantial savings in coal conveying costs.

Without obligation, a representative from our nearby office will be glad to help you investigate where *your* mining costs can be reduced. You'll find that modern, electrically-operated equipment is a profitable investment.

## Westinghouse

*Quality workmanship guarantees every Westinghouse product*

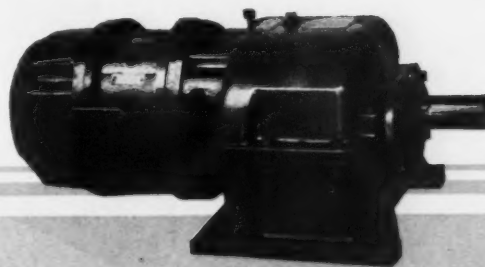
**YOU**

**Are Cordially Invited**

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Convention, Cincinnati, May 7-11.

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Floodlights      Gearmotor  
No-fuse Circuit Breaker  
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Improper explosives selection as well as improper explosives use may be *blamed* for checked coal—but it's *your* funeral just the same. Lump coal is live coal... prepared sizes keep business alive for the operator and dealer and keep the good will of the consumer.

Blakstix is a new powder... in a new cartridge... with a new action that produces

more lump coal. Blakstix *pushes* out coal—reducing checking—reducing crumbling—and producing a greatly increased proportion of prepared sized coal.

Let the Atlas representative tell you all about the many advantages that Blakstix offers. Then... whether you mine Bituminous or Anthracite... *let it live*, with Blakstix.

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NO. 1913344



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11 1/2

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- MAY 7-11, 1934 -

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# DEVELOPMENTS IN COAL MINING.

SEE BOOTHS 115-140 AT THE CINCINNATI EXPOSITION

All eyes on Cincinnati . . . the center of the entire coal mining world from May 7 to May 11, 1934. And there, at the very focus of attention, Sullivan proudly exhibits among other things, six units of tremendous interest—four new models out of Sullivan's complete line of kerf cutting equipment . . . two new time saving, cost cutting coal cutters and two new models of the famous Coal Saw. In addition, Sullivan will show two new hoists, models CHE-5 and RHE-5, of advanced design. Sullivan welcomes you to see the newest . . . at booths 115-140 at the Cincinnati Exposition, May 7-11, 1934.

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**Robt. Holmes & Bros., Inc.**

Western Representative  
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No. 52

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Equipment, Complete Tipples

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● Electro sheet Copper paper thin; Beryllium Copper non-sparking high speed tools; springs of longer life; non-

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● There is a Copper alloy for every service.

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RESEARCH ASSOCIATION  
25 BROADWAY, NEW YORK**

MAY, 1934

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*Yet they*

## Type KS-6A

*Simplest of all the starters this one is operated entirely by hand. It is designed for the D. C. motors on conveyors, loaders and other mining machinery.*

## Type KD

*There is no complicated mechanism in this starter which, when the knife-switch is engaged, starts the motor automatically, stops it when power is interrupted, and restarts automatically upon return of current.*

## Type KSD

*Quite similar to Type KD except operation is started with handle on outside of case. An additional safety feature.*

## Type DRT

*This starter incorporates an automatic circuit breaker and starting mechanism in one device.*

## The Brain

*Here is the brain of all of the new D. C. starters except the type KS-6A which is entirely manual.*

## Type AD

*When automatic remote or float switch control is required this is the starter you will wish to investigate.*

# SEE THEM AT THE CONVENTION



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# MAGIC

ARE you interested in an inexpensive yet a thoroughly dependable and completely protective D. C. starter for the motors of your conveyors, and other mining equipment? Have you a condition where automatic remote or float switch control on pumps and fans would be a convenience as well as an economy? Is fuse protection against overload adequate, or would you prefer to have a combined automatic D. C. motor starter and circuit breaker at the price usually paid for the starter alone? Any one or all of these conditions, yes and many more too, are being capably handled with these entirely new O-B Motor Starters which are to be on exhibition at the Mining Congress Convention.

Come into the O-B booth. Press a button or throw a switch. Watch the motors start. So easily and smoothly is the starting operation accomplished that it seems as if some magical force is at work. Look at the starting mechanisms. Their simple yet rugged construction details are obvious signs of lasting dependability. If you do not attend the Convention be sure to ask your O-B representative for a demonstration the next time he calls.

167EM

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Canadian Ohio Brass Co. Limited  Niagara Falls, Ontario, Canada

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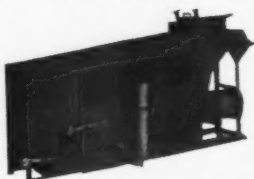
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# Everything

## YOU NEED for MODERN COAL PREPARATION

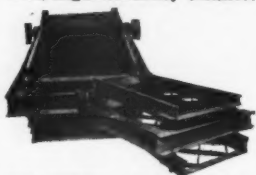
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**Stump AIR-FLOW Coal Cleaner and De-Duster.** Stationary Air Cleaner and De-Duster. Simplest, cheapest and most compact air cleaner ever designed.



**WUENSH Differential Density Coal Cleaning Process.** Cut shows cone and refuse collection of WUENSH low-cost, high-accuracy cleaner.



**RO-SIEVE,** the rotating, shaking sieving screen which has set a new standard for efficiency.

Coal companies are at work modernizing their production facilities to take quick advantage of the expected competition in business.

We are working with them—to straighten out production curves—to cut costs—to develop a more saleable product.

You will find it to your advantage to talk over this modernization work with us at this time.

**A**LTHOUGH we have introduced in recent years several items of new equipment for more economical coal preparation, we are not primarily interested in selling equipment.

Our chief work is the development of better *methods* of coal preparation at least cost to the operator with maximum efficiency and recovery—better systems of coal preparation and making it ready for today's highly competitive market.

Our work embraces all types of equipment and schemes of plant layout. For instance, we build plants which clean your coal up to 6" or 8" sizes by mechanical process—a wet plant or a dry plant or any combination of the two—a dedusting plant—a new plant or re-modeled plant—in short, any type of processing equipment which will best suit your requirements.

Whatever your preparation needs may be, our engineers can find the proper answer, whether it be new equipment or new methods. We invite you to make liberal use of our consulting service and test laboratory.



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PITTSBURGH, PA.

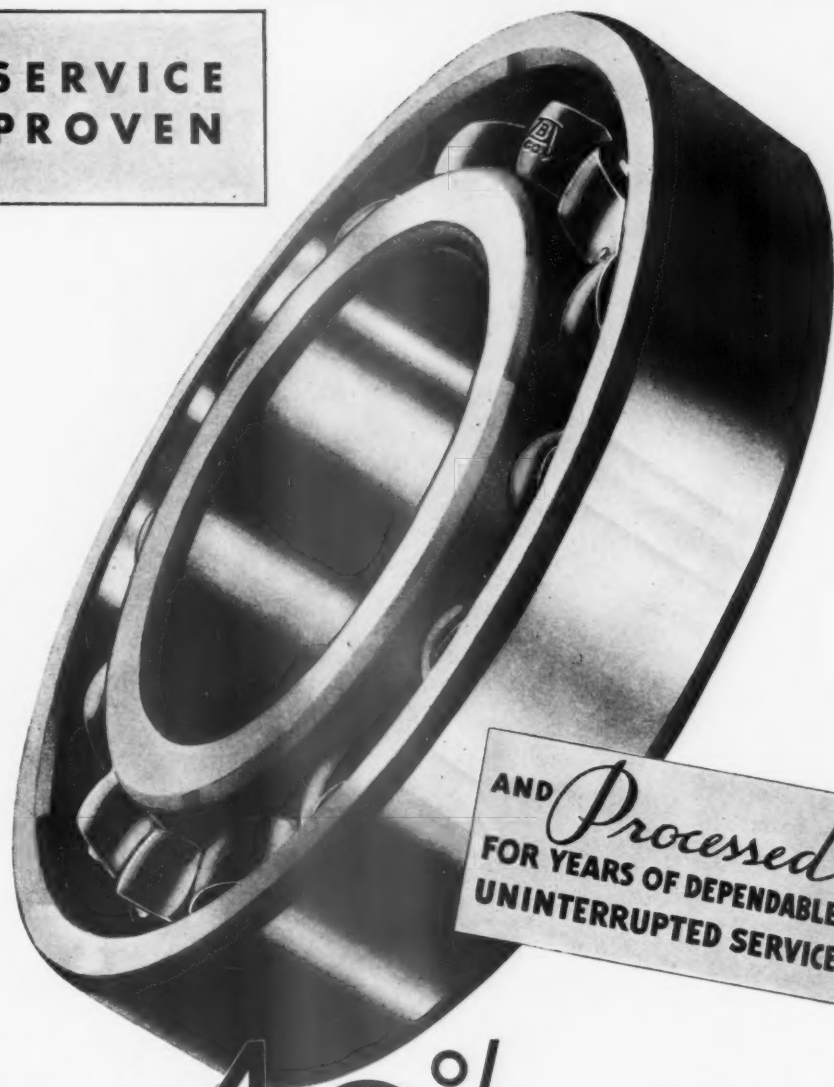
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HUNTINGTON, W. VA.

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DENVER, COLO.

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MAY, 1934

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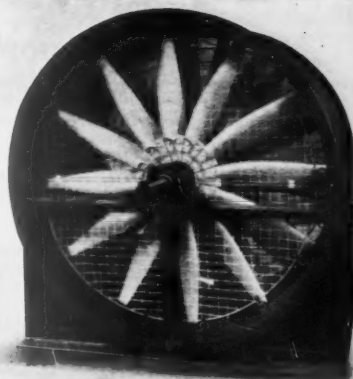
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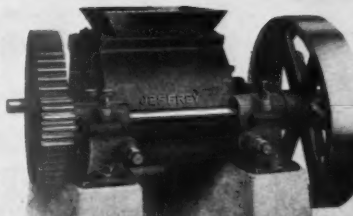
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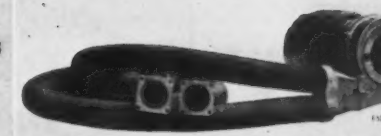
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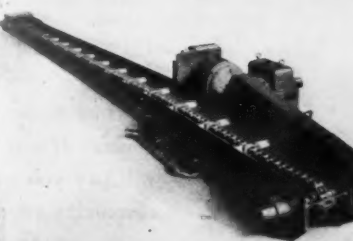
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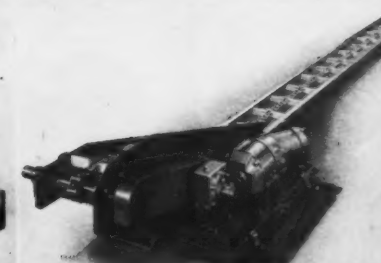
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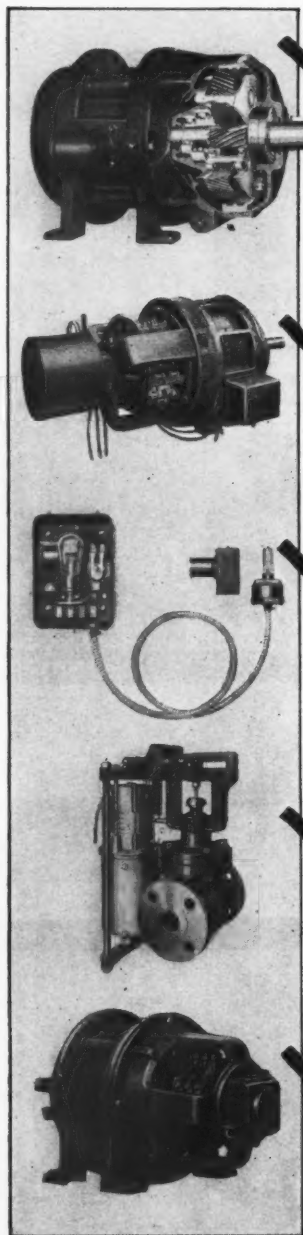
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*You are cordially invited to see our exhibit and the "House of Magic" demonstration in Spaces 107, 108, and 108A at the National Exposition of Coal Mining Equipment at Cincinnati, May 7 to 11. General Electric, Schenectady, N. Y.*

011-11

# GENERAL ELECTRIC



# A Deliberate Deception

**T**HE National Recovery Act includes four major purposes three of which are as follows:

(1) To spread employment by decreasing hours of service and to increase buying power by increasing wages;

(2) To permit business to organize under codes with authority to limit production; to cover required increased production costs by increasing selling prices, and by the elimination of unfair competition to make possible increased returns in the domestic markets;

(3) To protect those domestic markets, for all industries necessarily competing against importations of more cheaply produced foreign goods, in order that such industries might increase employment and make effective the purposes of the Industrial Recovery Act.

This relief was provided for by Section 3(e) of the National Industrial Recovery Act which like the end of the rainbow has been a lure to many who have sought its aid without avail. In the early days of the Recovery Act business men who came to Washington for the purpose of aiding in efforts to reduce unemployment and restore business prosperity, were free to say that the higher wages and shorter hours required by the Recovery Act must be accompanied by a restriction upon imports else its enforcement in certain lines of business was entirely impossible.

Deputy Administrators of the NRA approved inclusion in proposed codes of a provision to the effect that such code was not to become effective until proper restrictions upon imports had been made effective. Section 3(e) was the inducement which lead many industries to cheerfully concede the advisability of the Recovery Act and to give their fullest cooperation in making codes as required.

Section 3(e) provides that on his own motion, or upon complaint to the President, that any article or articles are being imported into the United States in substantial quantities or increasing ratio to domestic production under such conditions as to render ineffective or seriously to endanger the maintenance of any code or agreement under this title, the President may cause an immediate investigation to be made, and if, after such investigation the President shall find the existence of such facts, "HE SHALL, in order to effectuate the policy of this title, direct that the article or articles concerned shall be permitted entry in the United States only upon such terms and conditions and subject to the payment of such fees, and to such limitations, in the total quantity which may be imported, as he shall find it necessary to prescribe in order that the entry thereof shall not render or tend to render ineffective any code or agreement made under this title."

Under this provision it was fully believed that IMMEDIATE action would be taken to protect any industry which by reason of increased importations not only could not increase wages and shorten hours but could not compete with importations. As an inducement

to sign the NRA the act promised that the President would limit or prevent any import which "shall render or tend to render ineffective any code or agreement made under this title." The following table shows the production and imports of quicksilver for the last three years:

Domestic production 1931—24,000 flasks. Imports 567 flasks.

Domestic production 1932—12,000 flasks. Imports 8,000 flasks.

Domestic production 1933— 5,000 flasks. Imports 22,000 flasks.

Nine months have elapsed since a complaint on behalf of quicksilver was filed under this section during which a full year's supply of quicksilver has been imported which can be sold at prices so low as to make domestic competition utterly impossible.

An industry which has diligently prosecuted its efforts to get relief under this section; which has used the utmost diligence for code approval; which signed the PRA and kept its agreement, HAS BEEN PUT OUT OF BUSINESS FOR AT LEAST A YEAR AND NO HOPE IN SIGHT FOR BETTER CONDITIONS. It may fairly be stated that had it not been for the promise given under this particular section of the National Recovery Act, many industries would not have attempted to comply with the Recovery Act. The quicksilver industry was led into a trap and in its desire to cooperate, tied itself hand and foot by an agreement to pay higher wages for lesser hours of service.

In addition to this state of affairs it was shown that the European quicksilver Cartel, whose output was under the control of one selling agency had on hand, ready for immediate shipment, more than a five years' supply of our total domestic consumption. This foreign monopoly was and is able within a short period of time to pour into our market enough quicksilver to last this country for five years.

For some months it was thought that delay was caused by the necessary inefficiency of a rapidly expanding organization, but when it took months after the complaint was filed to issue an order for investigation by the Tariff Commission, months more to make the investigation, and from that time on to make a report which is still awaited, the suspicion is justified that these delays were a part of a program to prevent any action under this section.

The desperate appeals of the quicksilver industry for aid have met with no response. After all these months of waiting, no action has yet been taken. After all this experience is it unfair to say that Section 3-E of the Recovery Act is a joke? Is it unfair to say that the net result of activities under the Recovery Act as it relates to quicksilver has been to throttle this industry, to prevent employment, to confiscate millions of dollars invested in the industry, and that the industry has been a victim of deliberate deception.

*J. H. Calbraith*



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# "THE RULE OF



See Pure Oil Exhibit  
Booth 167  
NATIONAL EXPOSITION OF  
COAL MINE EQUIPMENT  
Cincinnati, May 7-11

## KEEP IT UP FRONT WHEN BUYING LUBRICANTS

Almost any lubricant has some merit. But few can have all the virtues. So you *must* check contemplated purchases with this "Rule of 3":

- 1 **Where the Crude comes from.** Since lubricants are first a product of nature, the favored fields are, naturally, few.
- 2 **How it is Refined.** Qualities not inherent in the crude cannot be added. Neither can good qualities be developed without the most expert Refining.
- 3 **How it is Applied.** The best of lubricants are indifferent performers when inexpertly Applied to each machine or process.

The three brief paragraphs at the right describe Pure Oil's "Three-Point Service" and square Pure Oil products with the "Rule of 3". Read them; it's your machine, your production, your money that's at stake. Then call in a Pure Oil man. Daily these men round out Point No. 3 to the satisfaction of increasing numbers of men like yourself.

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- (1) The right kind of CRUDE is important. Some types are better adapted to certain uses than others. Pure Oil Crude comes from many fields in nine states, not from a single area producing only *one* kind of Crude that must be recommended and sold for *every* lubrication need.
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MAY, 1934

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# The MINING CONGRESS JOURNAL

VOLUME 20  
NUMBER 5



MAY  
1934

*A Journal for the entire mining industry published by The American Mining Congress*

## **The Millennium Lies in the Future**

**A**MONG the numerous remedies that are proposed to cure our industrial ills is the one that we should discard, or at least restrict the use of machines and go back to the simpler methods of hand labor.

Those who advocate this course seem to lose sight of the fact that the permanent and lasting benefits which have come to all of us through mechanization and labor saving devices far outweigh the temporary distress which has occurred during this present time of readjustment. And even if we should be willing, or even able, to stop the forward progress of science and invention, and to go backward, we wonder what period in past history would be chosen as the ideal stopping place.

Suppose we consider this idea and see what we can find. In order not to overlook anything, let us go far back and start with the civilizations of Egypt and Rome. These nations were great builders, but they had no mechanical power—only human muscle. There was no unemployment, it is true, but there was something much worse—human slavery. These people were not savages or barbarians, they were as cultured as we are today and slavery was not primarily due to any innate cruelty or desire to oppress their fellow men; it was because at that time human labor was the only known source of power. Certainly we would not trade our machines for what they had.

Now let us hastily review the succeeding 2,000 years; the gradual upward struggle through the machineless Middle Ages—the privations and the famines because there was no way to provide for anyone except the chosen few of the ruling classes. Consider next the pioneer days of our own country—how our immediate ancestors worked without machines from dawn to dark for bare existence. Then think of our lives of today and decide whether or not we would like going back to any period in history that we can find.

Eliminating romance and considering realities, the more we know about past conditions, the less attractive they become. How many of us, while the blizzards of last February and March are still fresh in our minds, would like to go through another "Old-Fashioned Winter."

## **The New Deal**

**T**HE New Deal is creating a series of extreme recommendations that are of vital importance to mining. Not the least of these is the very obvious trend looking to the mobilization of labor against management. The newspapers are daily full of such things as the recent Alabama conflict with the United Mine Workers. General Johnson, in his original concept and explanation of

the NRA, painted the picture of Management on the one hand, Labor on the other, forming the two industrial posts with Government as the connecting arch forming the gateway to further prosperity. There is a serious possibility that labor's so-called post may grow out of all proportion to industry's post, with the resulting unbalance and the placing of undue power in the hands of a great organized unit. The mining industries must take full recognition of the situation and must adopt as its own organized labor's effective slogan, "*In union there is strength.*"

## **Do These Figures Lie?**

**T**HERE is an old expression to the effect that, "Figures don't lie, but liars will figure." Notwithstanding the nation-wide effort for the relief of unemployment, the official figures show that unemployment at the present time has not been greatly reduced. According to a report made by the American Federation of Labor, the number of unemployed in the United States in January, February and March, of this year, was something above 11,000,000 men. In the beginning of a similar period of 1930, the number was just above 3,000,000 men; in 1931, 7,000,000 men; in 1932, 10,000,000 men; in 1933, 13,000,000 men. This marked the high peak of idleness which from January, 1933, to January, 1934, was reduced to the extent of 1,412,000.

During the year from March 31, 1933, to March 31, 1934, it has been claimed that the National Recovery Administration was responsible for an increase in employment of more than 3,000,000, that the Civil Works Administration had employed something like 4,500,000, that the Civilian Conservation Corps had found employment for 250,000. Notwithstanding the reemployment of approximately 7,000,000 men the number of unemployed had been decreased only 1,000,000, leaving more than 5,000,000 men added to the unemployment roll during the period of returning business prosperity.

This fact furnishes some proof, at least, for the statements made by people from various parts of the country that the public support so freely offered has added 5,000,000 men to the list of unemployed, very many, if not all of which, had been and were able to support themselves, but found this opportunity for income so enticing as to lead them to leave their own vocation and accept the higher pay and the less stringent working requirements. It has been stated that county officials, many of them, were on the payroll of the Civil Works Administration; that farmers with plenty but less lucrative work at home had left their farms to accept these proffers and that the net result of the borrowed two or three billions of dollars spent in these enterprises, which must be repaid by the taxpayers in the future, has been to demoralize these millions of men



and to create an army which will never again be willing to earn its living. One of the great calamities of the New Deal is the development in the minds of so many people that they can milk the government for support when their own business enterprises are not equally lucrative.

It may be that our conclusions from the facts stated are not correct, but we shall be glad to hear from our readers with their knowledge as to whether the inferences given are correct or otherwise.

### **Straight Jackets**

**T**HE protests against further restrictive legislation in the investment field and the desire for some relief from the unwise restrictions of the Securities Act are being voiced from every part of the country. Money, it has been frequently said, is timid. By that it is intended to convey the thought that a man who has worked hard and faithfully to accumulate a surplus is much concerned for the protection of that surplus against loss. In these days money put into any business enterprise must have a promise of a large profit to offset the risks of loss. This is particularly true when government is being largely influenced by theorists with no taint of practical experience, who in some college cloister, work out a beautiful theory and find aid in legislative circles to enact these theories into law.

James A. Farrell, in an address made before the Rocky Mountain Economic Conference at Colorado Springs, made the statement that, "An economist is a man who knows all about your business but never faced a payroll." Even the economist described by Mr. Farrell is an angel of conservatism as compared with some of the theorists who are now assisting selfish interests in the development of legislation which will further frighten the investor, whose money must be put into business before we again reach a high point of prosperity.

Many investments have been made and many new men have been employed and business is better and getting better all the time, but let us not manufacture too many straight jackets, the use of which necessarily restricts development, prevents reemployment and acts as a menace to returning prosperity.

### **Foreign Trade**

**F**OR THE highest prosperity in the United States it is essential that approximately 10 percent of our total production shall be sold abroad. This has been the rule during many prosperous years. This does not mean that we cannot receive from foreign countries an equal amount of imports plus an additional amount sufficient to satisfy the debts of foreign nations to this country. That we have been able to export goods manufactured by wage earners receiving more pay than their foreign competitors has been made possible by the efficiency of American business, consisting of superior executive control, invention and mass production.

At this time, the National Recovery Administration, for the alleged purpose of increasing employment, is requiring higher wages for lesser hours of service, which must necessarily increase our domestic production costs by at least 25 percent. These men seem to believe that

this increase in production costs will make possible expanding foreign markets, while the logic of the situation points surely to decreasing foreign absorption of higher cost domestic goods. It is because of this fact that we regard as fallacious the hope that we may increase domestic employment by closing foreign markets to the production of labor. Let us remember that efficiency is the keynote to large production, large employment and the payment of large wages.

### **Silver and Permanent Prosperity**

**W**E HAVE frequently discussed the silver question and the underlying principles of silvers' use as a basis of currency. We have discussed this question not from the standpoint of the silver producer but as its use relates to world prosperity. We reiterate the belief that most, if not all, Government efforts to aid specific industries have been harmful rather than helpful. The extravagant waste of money intended to aid the farmer is complete proof of this statement. We do believe that there is need for a larger amount of real money and a severe limitation of the abuse of credit which has frequently, as in 1929, wrecked the prosperity of the nation.

No one can intelligently defend bank deposits of fifty-three billions of dollars with only eleven billions of money in existence. An effort to withdraw those deposits at any particular time would result in universal bank failures. The speculators and money sharks, who see these conditions in advance, would get the eleven billions and the business man would get nothing but grief. We need, and to prevent future business depressions, must have more real money. Money is a creation of government. No government can be trusted with power to create an unlimited amount of money. Its power must be limited by some fixed substance, the amount of which cannot be rapidly increased. Gold for 50 years has been accepted as that substance. It has been found wanting.

Silver is equally limited in amount of possible production. Its use as a basis of money would make possible a necessary and proper increase in the amount of currency and furnish a defense against the growing number of those who believe in unlimited inflation. The concentration of gold by a few countries, if continued a few years longer, will destroy the gold standard. Silver's use as a basis of money issues is a world necessity both to business and as a protection to the gold standard.

### **A Pig in A Poke**

**"T**HE hand is quicker than the eye" and similar homely but pertinent expressions are most applicable to the set-up of the proposed bargaining tariffs bill now subject of hearings before the Committee on Finance of the United States Senate. The bill has passed the House and is definitely a piece of administration legislation with its chief proponent, the Secretary of State, the most outstanding and uncompromising free trader in the nation today. If the bill before the Finance Committee becomes law, industries which have been pointedly named by dreamy, over-educated theorists in the organization which has been formed to administer the law, will awaken to find themselves bargained out of existence.

# RESEARCH PROGRESS

## FOR COAL

By DR. THOS. S. BAKER\*

**M**ODERN industry differs from the industry of every past period primarily in the present day application of scientific methods. It is because of scientific and technical investigations that our means of communication and transportation are so superior to those of the past, that we are able to use so many materials that the world has never heard of before, and that our ability to satisfy human wants and needs is so much greater than during any previous epoch. This stream of benefits from the use of scientific method has, of course, affected coal. The enormous expansion in coal production which took place in the decades preceding the World War was due primarily to the energy needs of industry which was growing at an unprecedented pace under the stimulus of scientific and technical advances. But in the last 15 years coal production has not been expanding; coal resources have fallen in value; apparently scientific research has been harming instead of helping coal.

In attempting to account for this situation the statement has often been made that the coal producers themselves have not been sufficiently active in fostering scientific research on their product. This is not to say that there has been no research on coal—on the contrary, there is now a great deal, some of the details of which will be given later—but rather that most of it has not been carried on by persons interested in the production and selling of coal. The electric public utilities, railroads, iron and steel works, and other large users of coal have through extended studies of fuel efficiency been able to reduce their unit coal consumption on the average to about two-thirds of what it was 20 years ago. If these studies had been carried on by producers instead of users of coal, the coal industry would have been able to reap some of the benefits from them. This lack of appreciation of the need for research by coal producers is even more clearly seen when we consider the activities of coal's competitors. The oil and gas industries have been able to get so large a part of coal's business largely because, through generously financed research, they have discovered and shown their customers how their products could be used more efficiently.

It is false, of course, to claim that the coal operators have never engaged in systematic scientific and technical studies. Steady advances in production efficiency and safety in coal mining have been taking place as the result of long-continued research. The coal operator apparently believes that this is his field and that he should confine himself to it, but as pointed out above, this is not enough. He must learn how coal can best be used and must take the lead in showing this to coal consumers. This means active interest in and support of research on the nature and utilization of coal. Only thus can coal compete in the modern world where the leading industries are those which most intensively apply modern science.

As we have said, there is even now a great deal of coal research being carried on by various agencies. Since the coal operator has little opportunity to become acquainted with this work, it seems worthwhile to give a brief account of what is being done both in this country and abroad, by both governmental and private organizations.

The United States Bureau of Mines carries on a great many studies of coal and its products. Although its budget has been repeatedly cut in recent years, it still plans to spend this year about \$500,000 on investigations connected with coal. About one-half of this is to go for problems connected with safety in mines, including studies of explosives and mine equipment, explosions, education in prevention of mine accidents, first aid, and mine rescue. The greatly improved coal mine accident record of the United States in the last three years can be largely credited to these activities. In addition, the Bureau conducts investigations on occurrence of coal, properties, cleaning and preparation, carbonization and gasification, friability, grindability, clinker formation and domestic fuels. The latter studies are the kind which are probably of the greatest value for the future expansion of the coal industry, but at present the Bureau can have a staff of only about 20 men engaged in them.

The anthracite industry supports a small laboratory at Primos, Pa., which engages in testing and approving equipment for burning anthracite, development of new equipment to make the use of this fuel more efficient and convenient, and makes comparative studies of competing fuels. The laboratory has developed an anthracite using gas producer for industrial use. The annual expenditure for the laboratory has been estimated at \$50,000. The Anthracite Institute also promotes research at Pennsylvania State College which has as part of its purpose the finding of non-fuel uses for anthracite. Promising work has been done there on the use of anthracite as a filter medium for water or sewage purification.

Studies in various problems of coal have been carried on through a system of fellowships supported from 1919 to 1932 by the Carnegie Institute of Technology and the Bureau of Mines, and since 1932 by the Institute alone. At present five such fellowships are in progress. The results of the studies so far carried out have been published in over 30 bulletins which include reports on petrography, blasting, rock dusting, washability, spontaneous combustion, carbonization, mechanism of combustion, composition of coal tar, and similar subjects.

The Coal Research Laboratory at Carnegie Institute of Technology was established in 1930 with funds from the U. S. Steel Corporation, the General Electric Company, the Koppers Company, the Westinghouse Electric and Manufacturing Company, the Standard Oil Company of New Jersey, the New York Edison Company, the Buhl Foundation, and the Carnegie Institute of Technology. A fund of \$74,500 was provided for laboratories, and contributions of \$90,000 annually were pledged for an initial period of five years. The purpose of the laboratory is to conduct fundamental scientific investigations on the nature and behavior of coal. At present the technical staff numbers 20, and 16 problems all centered around the primary question of the mechanism of thermal decomposition of coal are being studied. The practical value of fundamental work of this sort can not be expected to be apparent immediately, but future developments in improving methods of coal utilization and in finding new uses for coal will certainly depend on this kind of research.

\* President, Carnegie Institute of Technology.

It is to be noted that none of the supporting companies is engaged primarily in mining coal.

The Battelle Memorial Institute at Columbus, Ohio, supported partly by an endowment and partly by individual sponsors, is studying problems of the preparation and utilization of coal. Especially important has been their work on the combustion of pulverized coal. Other studies are on the effect of moisture on the burning of coal, briquetting, and on coal cleaning. At present the technical staff engaged in these studies numbers twelve.

Since coal is found in 32 states of the Union it is natural to expect research in problems related to coal to be supported by state institutions. Twenty states have sponsored studies by state universities or geological surveys or both. The total annual expenditure for this work has been estimated at \$150,000, but it may be double this amount. One of the defects of work done in this manner is that it is largely uncoordinated and the results coming from so many different sources are often lost sight of by the industry. When a central research organization is established by the industry, one of its functions should be to aid in the coordination of these scattered studies and in the collection and dissemination of the knowledge obtained through them. It is impossible here to go into the details of the work that is being done by state organizations, but it may be of interest to list the 20 states supporting studies of coal; they include: Pennsylvania, West Virginia, Virginia, Ohio, Kentucky, Indiana, Illinois, Michigan, Alabama, North Carolina, Iowa, Kansas, North and South Dakota, Minnesota, Montana, Utah, Texas, Colorado, and Washington.

In Great Britain the coal research situation is somewhat similar to that in the United States. There are government research agencies and many problems are studied at the universities, but we find the coal mine owners are frequently criticized for failure to support research (Sir H. Hirst-Colliery Guardian, October 21, 1932, p. 779). Yet they have been more active than American coal owners, for they have an organization called the British Colliery Owners' Research Association which although it conducts no research itself does make an annual grant of about \$13,500 for this purpose to Birmingham University and acts as a sort of technical information bureau. There is also the Lancashire and Cheshire Coal Research Association which was started 13 years ago to study the commercial uses of coal and at present employs five chemists and ten assistants.

Two British government agencies doing research on coal are the Fuel Research Board of the Department of Scientific and Industrial Research, and the Safety in Mines Research Board. The Fuel Research Board was established in 1917 to study problems related to the utilization of coal; it is financed by funds voted by Parliament, receiving at present about \$400,000 annually, and has a technical staff of about 50. It is conducting a survey of the British coal fields and has carried on extensive studies of carbonization processes, particularly at low temperatures. Pulverized fuel, purification and cleaning of coal, hydrogenation of coal and tar, and domestic fuels have also been studied. It is a noteworthy fact that although most of

the work of the board until recently has been conducted from an engineering standpoint with a view to obtaining results that would be of immediate value, it has recently been decided that more work of a fundamental scientific nature needs to be done, and a committee of eminent scientists has been asked to aid in directing the work of the board.

The Safety in Mines Research Board is financed by funds obtained from a levy of one penny per ton of coal produced which was imposed by the Mining Industry Act of 1920. Most of the income from this levy goes for miners' welfare, being used to provide education, pit-head baths, recreation facilities, and health services. About \$250,000 yearly goes for safety research by the board which has done some notable work in decreasing the dangers of coal mining.



DR. THOS. S. BAKER

In Germany the situation is quite different. Here we find coal research comparatively liberally financed by the coal owners. The beneficial effects of this policy can be seen from the relative prosperity of the German coal industry considering the enormous handicaps placed on it as a result of the war. The territory which Germany lost had produced about one-fourth of her coal before the war, yet the 1929 coal output of the remaining fields was only 3 percent less than that of the peak of pre-war Germany. Only about 40 percent of German coal is used in raw form, the remainder reaching the ultimate consumer in the form of briquettes, coke, gas, powdered fuel, oil, electric power, and various products of carbonization and hydrogenation. Progress in the chemical treatment of coal to yield new products has gone further in Germany than in any other country. It was here that the coal tar industry and hydrogenation were first developed.

The total annual contribution of the German coal industry to research may be estimated as equivalent to between one million and one and one-half million dollars. In 1933 it decreased somewhat. In addition the government contributes to some of the laboratories as well as through its support of the universities.

The best known research organization is the Kaiser Wilhelm Institute for Coal Research at Mülheim-Ruhr, founded in 1914 by the Kaiser Wilhelm Society for the Advancement of Science together with the coal industry and the city of Mülheim-Ruhr. At present it is supported principally by three large coal syndicates. The work of this Institute has been directed mainly toward a study of the scientific phases of coal utilization, especially the chemistry of coal. The collected publications are an impressive record of the work already done and an important source of information for all workers in this field. In addition, the Institute has been of value to the industry as a place for the training of fuel investigators.

Besides this and similar scientific coal research organizations there are private institutions supported by groups of collieries for the purpose of applying the results of scientific research to commercial operations. There are also laboratories at some of the technical universities engaged in studies related to coal and aided by contributions from the industry. Special coal problems are also investigated by commercial firms cooperating with groups of coal owners who pay the necessary expenses. We may add to this list such industrial organizations as the firm of Heinrich Koppers and the dye trust which have conducted coal research and have worked out important new processes for using coal. The studies of these various organizations cover a wide range including the chemistry of coal, briquetting, the burning process, coal petrography, origin of coal, biological aspects of coal formation, pulverized fuel, coking, gasification, liquefaction, drying, storage, and almost every other question connected with coal.

Czechoslovakia's coal output is only one-eighteenth that of the United States, yet it supports at Prague a coal research laboratory about as large as the German one at Mülheim-Ruhr.

We have briefly reviewed the existing establishments for coal research in this and other countries, and seen that the coal industry here has given very little to the support of research. Let us see what the competing industries have done in the way of research.

In 1925 the American Gas Association established at Cleveland a laboratory to test and approve gas appliances, to determine standards of performance for these appliances, and to carry on studies related to the use of gas. At first the laboratory was supported by 275 company members who contributed 1.5 cents per customer meter, but this was soon found unnecessary because the laboratory became self-supporting, and for the last few years has been making a profit. The research activities of the laboratory include such studies as the elimination of noise from industrial gas burners, combustion space requirements, and the methods of using gas to meet the special fuel needs of various industries. The estimated expenditure for the work of the laboratory this year is \$130,000. In addition, the American Gas Association sponsored a five year industrial research program with annual contributions of \$100,000 from company members. The work was allotted to various research organizations best fitted to investigate particular problems. The value of the research work of the American Gas Association can be seen from the great in-



creases in the use of gas in recent years. It has given to industrial gas an importance that it never had before, and will continue to yield returns for years to come.

In the oil industry—coal's most serious competitor—we find an even greater emphasis on research. Here most of the work is done by the individual companies, the larger ones supporting extensive laboratory and field investigations which occupy hundreds of technical workers. It has been estimated that the petroleum industry employs between 2,500 and 3,000 people in research connected with production, refining, and utilization and spends about eight million dollars a year on this work. The American Petroleum Institute has sponsored a five year program of research on which it spent \$575,000, the work being done in various university and government laboratories. In addition, it has spent about \$10,000 yearly for the last ten years on various cooperative research projects. It is hardly necessary to point out that here also research has yielded very tangible returns.

That bituminous coal producers are now aware of the mistake in not financing research is seen from the organization of Bituminous Research, Inc. The plans for this organization have not yet been fully worked out, but it probably will not be long before it starts functioning. In planning such an organization it is essential to have clearly in mind what sort of work it will do and what is to be expected of it. The coal industry needs to do extensive research of both a scientific and engineering nature if it is to regain the ground lost to competitors. But it must be remembered that a research program can not be expected to yield immediately results that will show up on the balance sheets. It can, however, be stated that an intelligently planned program of research that is consistently pursued—both in years of prosperity and years of depression—should ultimately yield returns greater than the amount expended on it.

The problems that might be considered by a coal research organization and the resulting possible future developments in the industry are manifold. It may be worthwhile to outline a few of them.

Probably one of the first major problems to be attacked would be the elimination of smoke. The smoke that pours from our chimneys is not only a waste and a nuisance but very definitely harmful as well. If the coal producer would take the lead in the drive to end this evil, he would not only be performing an important service to society but would also improve the position of the coal industry. Probably the first line of attack on this problem would be the development of automatic equipment for burning coal smokelessly. This kind of equipment makes the use of coal more convenient and thereby removes one of the important advantages that competitive fuels have over coal at present. An intensive study of this question would enable the coal producers to specify the kind of coal best suited to a particular type of equipment and also to inform the consumer as to which type of equipment to install in order to make the best use of the coals available in his region. Information of this type should come from the seller, not from the user of coal. But it must not be imagined that these questions can be settled immediately; there is needed both fundamental

research on the process of burning coal and engineering research on the design of better coal burning equipment.

Another possible solution of the smoke problem is the use of a smokeless fuel prepared from coal instead of raw coal. The principal fuel of this kind at present is by-product coke. Its use as a domestic fuel has been increasing steadily in the last few years although the cost is higher than that of coal. The advantage to the coal producer in the use of coke instead of coal is obvious from the fact that 1.4 tons of coal are required to produce one ton of coke. The reduction in the price of coke which is needed if its use is to become more widespread could come about either through an increase in the value of the by-products or through a decrease in the cost of coking equipment. Both of these are difficult problems that can be solved only by long-continued research, and the impetus for this development should come from the coal producer.

The hydrogenation of coal to liquid fuels is certain to be an important development of the future. The world's supply of crude oil is very limited compared to the supply of coal, and even the United States with about one-half of the world's reserve of petroleum is only certain of 10 to 15 years' supply, although exploration may uncover new fields. In England, Germany and Japan projects for hydrogenating coal on a large scale have already been started. In these countries the emphasis is on the production of gasoline, whereas here it would be on the production of a fuel oil, since the supply of crude petroleum will be used to produce a greater yield of gasoline, thus increasing the price of fuel oil. Coals vary greatly in their hydrogenation characteristics and coal operators should recognize the need for determining the value of their product for this process, which is sure to become important in the near future.

Another possibility for the future of coal, and one which has been but little touched up to the present, is its use for non-fuel purposes. Coal is a chemical but its chemical nature is as yet very poorly understood. With an increase of our knowledge of what coal is will come an increase in our ability to get new and valuable products from it.

As has been frequently emphasized, we can not expect to solve all the problems outlined immediately, but only after long-continued studies which may at times seem unprofitable. We should realize that the essential aim of coal research must be to make our resources of coal more valuable to the whole nation, thereby making them more profitable to coal producers.

**A** PLANT designed to produce 100,000 tons of oil annually by hydrogenation of bituminous coal, and capable of treating in addition certain quantities of high or low temperature tar, will be placed in production before the end of this year by Imperial Chemical Industries, Ltd., stockholders were informed at the annual meeting by Sir Harry McGowan, chairman.

The capital expenditure on the plant will exceed £2,500,000, provided out of existing liquid resources. The construction work was started last autumn and the value of expenditures and orders

placed up to March 31 last totaled £1,600,000. The total employment entailed in the construction, both direct and indirect, is estimated at 13,600 men.

By formation of the International Hydrogenation Patents Co., patent difficulties have been removed and a definite market in Britain would be assured for gasoline made by Imperial Chemical Industries, Ltd., which would not be concerned with the distribution, but would turn over in bulk to nominated oil distributors who would pay Chemical a net average market price.

Sir Harry anticipates an orderly development and a great future for this new industry. He also referred to the importance of the amalgamation of the Argentine interests of his company and du Pont, which logical constructive efforts will improve the position of the two companies in the Argentine industry.

Sales of solid carbon dioxide quadrupled last summer, and an additional plant has been laid down and a company formed to coordinate the world interests outside the United States.

All of Chemical's subsidiary companies in Australia, Canada and South Africa showed increased production last year, and Sir Harry said he looked for continuance of this trend.

Sir Harry said he hoped to see in the home market extension of the present rate of capital expenditure through relaxation of existing restrictions by public authorities and by slum clearance, and through greater confidence evident in industrial circles.

"No steps could be too bold or too vigorous for the present temper of the British people," Sir Harry said. He indicated that he did not expect the improvement abroad to be either as rapid or as widespread as at home, but that it must rest on the cumulative results of commercial agreements with different foreign countries.

Dealing with Japanese competition, he emphasized the importance of personal contracts between industrialists of both nations and referred to the reciprocal agreements concluded with Japanese producers of synthetic nitrogen on his own visit to Japan last winter.—*From the Wall Street Journal, London Bureau.*

**C**ANADA produced 1,403,066 ounces of silver in January; during the preceding month 1,086,434 ounces were produced and in January, 1933, the output was 1,383,776 ounces, according to a report issued by the Dominion Bureau of Statistics at Ottawa.

Lead production in Canada in January advanced to 28,022,906 pounds, the highest monthly total on record since January, 1931. The December output totaled 19,883,504 pounds and the January, 1933, total was 20,782,296 pounds.

Canadian zinc producers reported an output of 21,767,490 pounds in January as against 21,868,002 pounds in December and 13,892,630 pounds in January, 1933.





*A Safety Man Trip*

# Progress in Safety in Coal Mining in the United States\*

By D. HARRINGTON †

**D**URING the five-year period 1906-1910, inclusive, 84 major disasters (a major disaster being one in which five or more lives are lost), or an average of 17 per year, occurred in the coal mines of the United States, and the total number of fatalities from coal-mine gas and dust explosions (major plus minor) for the five years aggregated 2,388 or 477.6 per year. The monotonous continuance of coal-mine disasters month by month aroused the people of the United States to such an extent that it was felt necessary for the Federal Government to try to do something looking toward the avoidance of the admittedly excessive loss of life in our coal mines; this was one of the deciding factors in the establishment of the United States Bureau of Mines in 1910. That results have been obtained in this particular cause of coal-mine accidents may be seen from the fact that for 1933, only one major explosion disaster occurred in the coal mines of the United States, and the total number killed in that disaster was seven. Unquestionably the coal-mining industry, through use of safer mining practices and aided by the various types of work of the Bureau of Mines looking to prevention of mine fires and explosions, is in large part responsible for this very creditable change.

If the gas and dust explosion fatality rate of 1.059 per million tons of coal

produced during the period 1906-1910 inclusive had continued to the first of January, 1934, instead of the 6,378 deaths which actually occurred due to gas and dust explosions, there would have been 13,480. Hence, during the 23-year existence of the Bureau of Mines there has apparently been a saving of about 7,102 probable deaths, an average of more than 300 per year, from gas and dust explosions as against the number which would have occurred had the fatality rate for 1906-1910 continued. Thirty-nine persons were killed in all kinds of explosions (both major and minor) in the coal mines of the United States in 1933; if the 1906-1910 fatality rate of 1.059 for gas and dust explosions had been in effect in 1933, about 400 persons would have been killed. Unquestionably, the various teachings of the United States Bureau of Mines aiming to prevent explosions and fires in mines have had a vital influence in reducing the number of explosions and fires and also in decreasing their destructive effects if they do occur. During the past six or seven years rock-dusting, long advocated by the Bureau of Mines, has been instrumental annually in saving 200 or more lives through limiting explosions which have been initiated or through preventing explosions from getting a start.

During the five-year period 1906-1910 inclusive, 13,288 persons were killed in the coal mines of the United States, an average of 2,658 per year, and the fatality rate for this five-year period was 5.89 persons killed per 1,000,000 tons of coal produced. The number killed in our coal mines in 1932 (the latest date for which complete figures are available), was 1,207, and the fatality rate per 1,000,000 tons of coal produced was 3.36, next to the lowest fatality rate in the recorded history of coal mining in the United States, the lowest rate (3.31) having been established in 1931; tentative figures for 1933 indicate that 1,013 fatalities occurred, with a fatality rate of 2.69 by far the lowest number killed as well as the lowest coal-mining fatality rate on record.

The number of fatalities, as well as the fatality rate per 1,000,000 tons of coal produced, have fallen steadily (though with a few "peaks" in isolated years). The significance, as well as the magnitude, of this decrease in the coal-mining fatality rate is apparent when it is known that if the 5.89 fatality rate for the five-year period 1906-1910 had continued to the first of January 1934 the number of fatalities in the coal mines of the United States would have been 24,300 greater than they actually were; hence, during the 23-year life of the Bureau of Mines the fatality rate has been reduced sufficiently to indicate an average annual saving of life of more than 1,000 persons per year; similar figures on prevention of non-fatal accidents are not available, but it is esti-

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† Chief, Health and Safety Branch, U. S. Bureau of Mines, Washington, D. C.

mated that about 50 nonfatal accidents occur to 1 fatality, hence it is probable that nonfatal accidents numbering around 50,000 annually have also been eliminated. If the cost of a life to the operator is put into cold-blooded dollars and cents figures and a relatively low amount such as \$5,000 is taken as the "value" of a life, it will readily be seen that, irrespective of ethical or humanitarian considerations and not considering nonfatal accidents, the annual saving of somewhat more than 1,000 lives may be considered as "worth" more than \$5,000,000 or almost five times the total amount being expended by the Bureau for any year of its existence. If in addition it is conceded that as many as 50,000 nonfatal accidents per year have been prevented (and the assumption is by no means a wild one) and the "cost" to the operator in compensation, hospitalization, etc., of a nonfatal accident is placed at \$100, it will be seen that at least an additional \$5,000,000 has been saved to the coal industry through the safer operation of the past 23 years.

The benefits to the workers in and around coal mines due to this increased safety of operation are much more impressive than those to the mine operator. Preventing the death of 24,300 coal-mine workers in the past 23 years has obviously alleviated inestimable suffering, pain, and misery to the families who would have been bereft of their loved ones. And preventing 50,000 or more nonfatal accidents annually for 23 years certainly has saved the miners, their families, their friends, and the community untold pain, inconvenience, and misery.

The financial losses the workers have avoided through this increased safety of coal-mine operation are in themselves colossal. The average age of the coal-mine worker who is killed is about 35 years and in general, he should under normal conditions have a future active working period of at least 20 years. In normal times he should earn at least \$1,000 annually, hence in his 20 years of active life expectancy would receive approximately \$20,000 for his services. Saving the lives of about 24,300 coal-mine workers in the past 23 years through a decreased death rate in coal mining has therefore prevented a financial loss to them of at least \$486,000,000, and this does not take into consideration the financial losses saved to the worker through elimination of large numbers of nonfatal accidents. Thus, for the past 23 years an annual saving of more than \$21,000,000 has been made to coal-mine workers in preventing fatalities; \$21,000,000 is far more than the total expenditures on safety work by the United States Bureau of Mines since its establishment in 1910, therefore coal-mine workers unquestionably are reaping annual dividends of several hundred (probably several thousand) percent on the expenditures of the Federal Government in the promotion of safety in coal mining.

While progress has been toward safe operation of coal mines—much, if not most of it in the past five years—it would be a terrible mistake to assume that the ultimate in safe operation of coal mines has been reached, as this is anything but the truth. The latest available statistics indicate that coal mining still has the highest or worst accident rate of the major industries of the United States and that the industrial

accident rate of the United States is the highest or worst of all countries in the world except Chile. While progress has been made and is being made toward safer operation of our coal mines, the work has only begun, and the end should not be at hand until accident occurrence in our mines (coal, metal and nonmetal) has been reduced at least 75 percent below what it is at present.

No doubt many, probably most, old timers in coal mining, including both officials and workers, on reading the above statement will immediately say that it is utterly out of the question to reduce "present-day accident occurrence" at least 75 percent. Their conclusion could not have been refuted very successfully as late as six or seven years ago; however, since about 1925 so many instances are available of reduction in accident frequency, accident severity, and accident cost of 90 percent or over compared with past records that placing the figures for accident reduction at 75 percent is well within conservative bounds.

An excellent illustration of what can be done and how to do it, as well as the result of reasonably well-directed effort, is offered in the following paragraphs, from a talk by a prominent coal-mining operating executive, and the data which follow indicating some of the relatively recent accomplishments of his organization:

"I was born in a mining camp and have spent all of my life within a stone's throw of a coal mine or in some phase of work connected therewith. I think I am reasonably familiar with the attitude of the average operator towards safety as well as the attitude of the average miner towards safety. Frankness is one of the requisites for successful safety work, therefore, at the risk of criticism, I will be frank with you on my own attitude towards safety until about five years ago. Along with the various members of our supervisory force, I permitted myself to believe that safety and efficiency were words which could not be uttered in the same breath. Accidents were something that just simply happened in every coal mine and little or nothing could be done about it. The average miner would not cooperate in accident prevention work. On the contrary, he was hostile. Effective safety work increased the cost of production. The practice of safety first slowed down production. Organized safety work as required by insurance companies was something to be done at a minimum of cost and effort because it amounted to nothing in the end. In the interest of what I thought was efficiency, I permitted practices that were subsequently shown to be both unsafe and inefficient. I feared to be frank on responsibility for accidents because I was being told that we were 'getting by' with thus and so and if the matter were thoroughly aired, we would suffer in production costs. I did not want injuries or fatalities any more than I do now. I simply was possessed of a feeling of helplessness.

"I know that what I have just told you very frankly of my attitude is no different from the old-time attitude of the average operating man from the top to the bottom. I also know that in making such frank admissions, I am opening up the way for criticism of myself, yet I believe so sincerely in safety work that I am willing to take such a chance if my own experience will be

helpful to others. However, I don't want to be greeted with any headlines such as 'Good Operator Makes Startling Admissions.' I want to add here that the accident experience at our properties at that time was no worse than the average, and even at that was some better than that which prevailed at some mines where loud but insincere safety work was being done.

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"Many mining men do not yet believe that safety and efficiency go hand in hand. A careful study of any given piece of work will disclose safe and unsafe ways as well as efficient and inefficient ways. The combination of safe with efficient invariably produces a result which over even a short period of time results in lower costs. The desired combination is never reached without using one's brains.

"The common belief among mining men is that organized safety is costly. Nothing could be farther from the truth. The appearance on the payroll of a safety engineer, the appearance of monthly invoices for safety signs, literature, prizes and what not, should give no broadguage operator any pang of concern. The efficiency which comes as a by-product from safety work offsets the cost. The real price to be paid for safety is brain work. Most of us are lazy mentally and do not like to think. If we can overcome that laziness and really think about safety, the battle is won and the cost is small.

\* \* \* \* \*

"Little has been said about results. At — we now employ 1,500 men. We have our own hospital of 24 beds and staff of surgeon and three nurses. On my last visit to the hospital several weeks ago, I did not find a single patient confined there. I think that tells the story. Safety work is a very definite part of my duties. During the past few years of strife and turmoil, when accomplishment of anything seemed impossible, safety work has stood out as something on which results could be shown."

The company under the operating supervision of the man, who relatively recently made the above statements, reduced its accident frequency from 340.15 in 1929 to 74.04 in 1933, or over 78 percent in the five years, and reduced its accident severity from 43.74 in 1929 to 2.09 in 1933, or over 95 percent in the five years; and in addition has produced nearly 2,400,000 tons of coal since the last fatality. Moreover, the cost of the safety work of this company, making this impressive demonstration of improvement in safety in coal-mine operation, is given as considerably less than ½ cent per ton of coal produced. This figure on the cost of safety work compares very favorably with the 10 or more cents per ton now generally believed to represent the cost of accidents in the coal mines of the United States.

Numerous instances are available of a sharp decrease in the rate of accident occurrence in coal mining during approximately the past four, five or six years. One large producer of coal in the period, 1930 to 1933, inclusive, reduced accident frequency 89.2 percent, accident severity 97.2 percent, and the direct cost (compensation, plus hospitalization) 91.3 percent, or from \$0.08 per ton in 1930 to \$0.007 per ton in 1933; another large producing coal company reduced accident severity from 22.10 in

1929 to 1.93 in 1933, or more than 90 percent; another reduced accident frequency 75 percent between 1929 and 1933; and so on.

Prior to about 1925, few, if any, coal-mine operators even thought of trying to operate a fairly large-capacity coal mine for a year, or even a month, without a lost-time accident, and most coal operators felt decidedly fortunate in working a good-sized mine as long as a year without one or more fatalities. As indicative of the change, not only in the attitude of mind of many coal-mining people during the past few years but also in accomplishment in safety of operation, it is significant that during 1933 at least 12 coal mines had records of having operated an entire year or more without a lost-time accident; the 12 coal mines, or companies, produced an aggregate of 2,368,000 tons of coal without a lost-time accident, the smallest having produced about 70,000 tons and the largest practically 380,000 tons in the year or more of operation, the average production of the 12 mines being nearly 198,000 tons in the no-lost-time accident period.

One coal mine now has hauled nearly 1,268,000 tons without a lost-time accident; another has produced approximately 1,400,000 tons without a lost-time accident to its tipple force, and one has not had a lost-time roof-fall accident in the production of more than 1,180,000 tons. Numerous records are available of production of 1,000,000 or 2,000,000 or more tons of coal without a fatality; indeed some coal mines have worked 10, 20, or even 30 or more years without a

Right—A Safety Post.

Below — Instructions on Where and How to Place a Prop.



Constructing a Permanent Ventilator Stopping

fatality, and numerous instances are at hand of individuals who have worked 10, 20, 30, 40, 50 or more years in coal mines without a lost-time accident.

Present-day thought throws upon the shoulders of the operating officials, and especially the face bosses, much of the responsibility for avoiding of accidents in and around mines; and face, section, or division bosses in coal mines now are establishing decidedly good records of avoidance of lost-time accidents to em-

ployes under their supervision or guidance. One assistant foreman has not had a lost-time accident to his working force in approximately 262,000 man-hours of exposure to workers; another sub-boss has safeguarded his charges for 240,000 man-hours without a lost-time accident; and several others have exceeded 200,000 man-hours of exposure

without a lost-time accident to workers under their supervision.

While only a few of the really praiseworthy records of safe operation of various phases of coal mining have been given and many others are available, it is rather a sad fact that probably not to exceed 20 percent, certainly not more than 30 percent of those who operate or work in or around our coal mines are convinced that coal mines can be conducted without occurrence of accidents,

or at any rate, with occurrence of not more than 10 percent of the present accident rate of most of our coal mines. Here is a real problem, and it is probable that the solution lies almost wholly in education, and that compulsion methods are likely to be effective only to a limited extent.

While numerous bituminous mines in the United States are protecting their employes by using many, if not most, of the available safety methods and equipment, numerous mines, for one reason or another (usually inconsequential), fail to observe common-sense up-to-date safety requirements; as a result, our bituminous coal mines have the poorest accident experience and accident rates of coal mining in any nation in the world. The adoption and countrywide enforcement of certain minimum safety requirements would go far toward bringing to our bituminous coal-mine workers a degree of safety in their work to which they are justly entitled.

Recent investigations reveal that at least 10 per cent (and in some cases much more than 10 percent) of the mine cost of producing bituminous coal is due to accidents, amounting to between \$30,000,000 and \$50,000,000 per year for the United States. Many companies, by using up-to-date safety methods, have reduced their accident costs as much as 95 per cent; it is conservatively estimated that accident costs for the bituminous industry of the country as a whole can readily be reduced at least 50 percent. Moreover, if all bituminous coal mines were required to comply with certain minimum safety requirements, numerous inequalities in mine-operating costs would be equalized, to the advantage not only of the workers, but also of the right-minded operators and ultimately the general public.

When mine disasters with heavy loss of life take place, or when single fatalities, or even minor accidents occur, much of the burden finally falls upon the coal-consuming public, or the public at large, as the high cost of accidents to mine operators ultimately is passed on to users of coal. In addition, while the compensation payments received by victims of accidents or their dependents help them temporarily, in general the families of crippled or killed miners or the crippled miners themselves become

(Continued on page 61)





## WHEELS OF GOVERNMENT

**W**ASHINGTON is buzzing with "right" and "left" conversation. This or that legislative proposal or Administration ruling is immediately tagged and classified according to the viewpoint of the reviewer. The city has become in truth the national cross roads to the distress of its regular inhabitants, and the joy of the hotels. Added to the confusion occasioned by the avalanche of industrialists who have haunted NRA offices and Congressional corridors, must be added this month, the D. A. R., the Daughters of 1812, and the Cherry Blossom Festival. All in all Washington has resembled a "run on the bank."

Paralleling the physical confusion has been the mental distress of those marooned in Washington unable to either get action or go home. The coal men, anthracite and bituminous, have camped on the trail of the NRA officials. The conferences, public and private, have been tense with divided opinion, Government determination, and operator opposition. Beginning with the hearing on April 9, which was followed by the pronouncement of the 7-hour day, 5-day week, \$5 wage scale, down to and including conferences concluded April 20, the air has been thick with verbiage.

Not to be outdone, the silver horde descended upon Washington, determination plainly stamped upon them. At this writing all efforts to change the President's view in relation to this important metal have been unavailing. Undoubtedly something will be done for silver, but it is quite unlikely that any of the proposed legislation can be put through this session.

Copper has continued to hold the limelight, and has ceaselessly worked with administration officials on code ideas. Lead and zinc are also tied to the same band wagon, although it is now anticipated that all the major differences have been cleared up, and that all branches of the industry will shortly begin to function under approved codes of fair competition.

Congressional corridors have been resounding to the footsteps of the opponents of the Wagner Labor Disputes Act. The opposition has been persistent and definite. Practically every major industry in the country has gone on record against the legislation. Various reports continue as to whether it can become a law this session, with the preponderance of opinion on the negative side. Senator Wagner believes (publicly at least) that the bill will be enacted, perhaps in slightly modified form. Few share his belief, and the general opinion is that it cannot possibly pass this session.

Within the din the small voice of congressional adjournment is heard. Feebly, to be sure, but nevertheless there. At first the date of adjournment was fixed as May 1, but it has gradually been advanced until at this writing, June 1 seems to be the earliest possible date of adjournment.

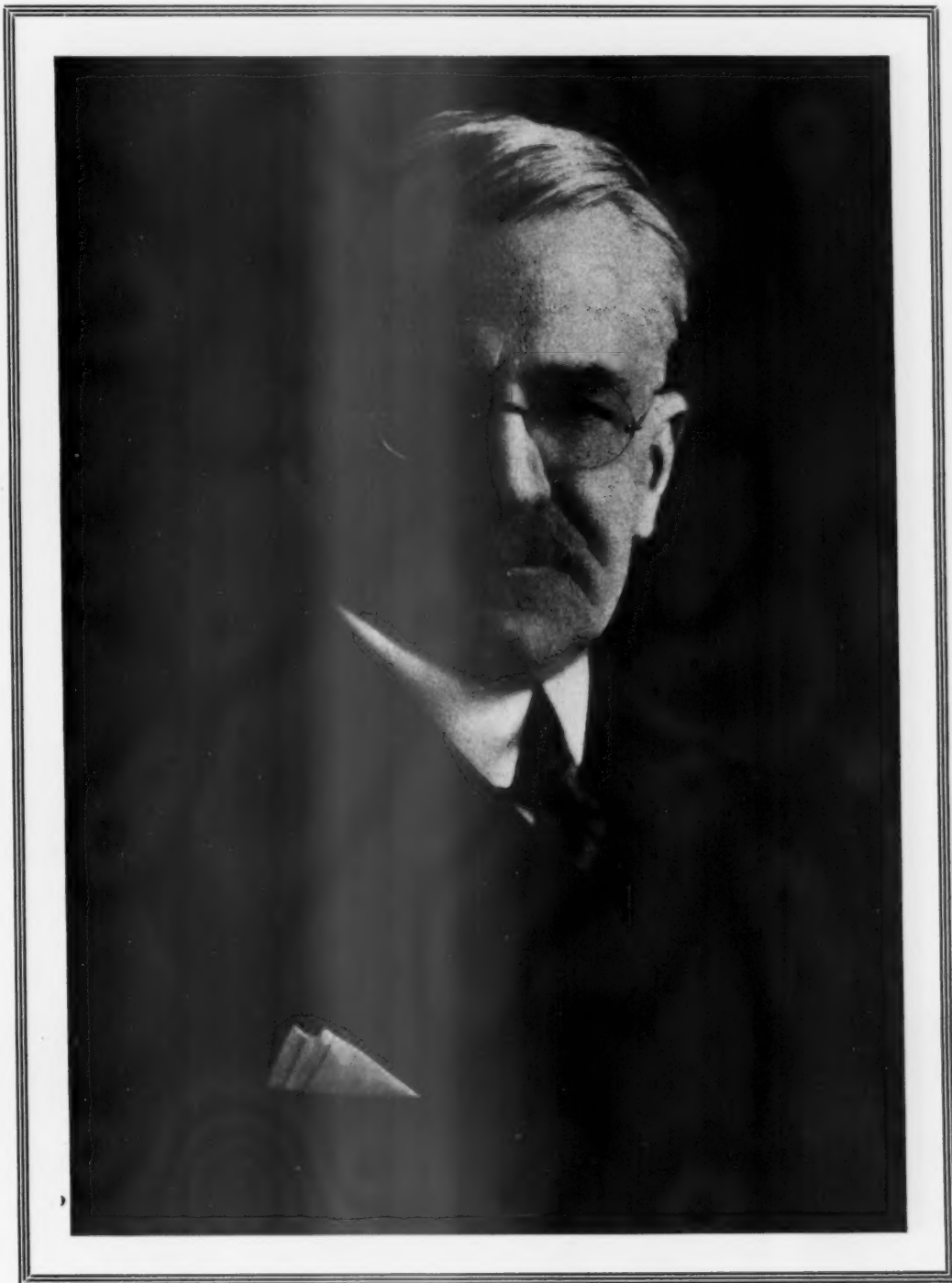
The Revenue Bill is "in conference." It passed the House and Senate with several provisions that are highly inimical to the mining industries. Conference report is anticipated at a very early date.

But while the Administration veers "right" on labor measures, it finds Congress going further "left" than it wishes on taxation. The House has reflected the Administration attitude in disapproving the Couzens amendment raising income taxes by 10 percent and sending the bill to conference. A number of amendments which the Senate tacked on to the House bill will likely result in delaying enactment of the bill. There is considerable disagreement on the Borah amendment to eliminate consolidated returns and the LaFollette provisions to make tax returns open to public inspection does not meet with approval. This latter provision will probably be modified to make the inspections discretionary with the President. Secretary Morgenthau opposed the Borah amendment when the bill was in committee but it is doubtful whether the Administration will vigorously oppose the amendment if the House insists on retaining it. Chairman Harrison of the Senate Finance Committee believes the provision will be thrown out in conference.

Another important measure, the Wagner-Lewis unemployment insurance bill, is in pretty much the same status as the Labor Disputes Bill, but in this case the element of time is a stronger factor. The opposition to this bill, which taxes employers' payrolls 5 percent to provide a fund for unemployment benefits is not nearly as great as to the labor bill but there is general recognition that there is not yet sufficient employment to justify unemployment insurance. Another element is that the Administration doesn't

(Concluded on page 63)





**J. F. CALLBREATH**  
*Secretary, The American Mining Congress*

# THE ELEVENTH ANNUAL COAL CONVENTION



Chas. W. Connor

**T**HE 1934 convention and exposition of The American Mining Congress promises to establish a new record for these events. The National Committee, responsible for the development of the program for the eleventh annual meeting, scheduled for Cincinnati, Ohio, May 7-11, has completed its work, and has presented for the industry's consideration a five-day program of unusual merit. The committee has worked diligently for many weeks to arrange a program that will meet the present need of the industry. That they have been successful is evidenced by the program itself, presented in this issue.

The convention has been in the hands of Mr. Chester M. Lingle, vice president, The Buckeye Coal Company, and the following district chairmen: I. N. Bayless, assistant general manager, Union Pacific Coal Co.; C. W. Gibbs, general manager, Harwick Coal & Coke Co.; C. F. Hamilton, vice president, Binkley Coal Co.; Chas. W. Connor, superintendent of Mines, Nellis Coal Corp.; D. A. Reed, manager of operations, Consolidation Coal Co.; C. A. Gibbons, general manager, Susquehanna Collieries Co. together with a committee representing every district. Members of the committee are: James M. Cook, general superintendent, Imperial Coal Corp.; A. B. Kelley, L. E. Young, vice president, Pittsburgh Coal Co.;



C. W. Gibbs



C. F. Hamilton



D. A. Reed



I. N. Bayless



C. A. Gibbons



**C. M. LINGLE**  
*National Chairman of the Program Committee*  
**Eleventh Annual Coal Convention**

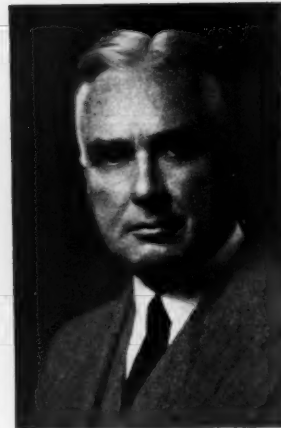




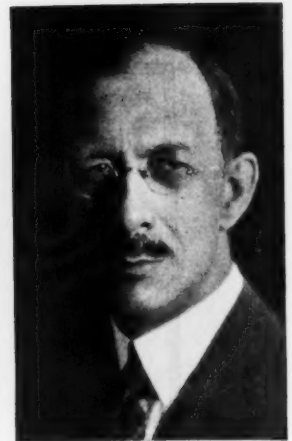
**D. D. Dodge**



**Horace Moses**



**F. S. McConnell**



**L. E. Young**



**Jos. L. Osler**

Thos. G. Fear, assistant to president, H. C. Frick Coke Co.; Harry M. Moses, general superintendent, United States Coal & Coke Co.; L. J. Lorms, assistant to president, Lorain Coal & Dock Co.; W. P. Vance, general superintendent of mines, Butler Cons. Coal Co.; T. F. Whelan, general superintendent, Pittsburgh & Erie Coal Co.; D. D. Dodge, vice president, W. J. Rainey, Inc.; F. S. Pfahler, president, Superior Coal Co.; J. B. F. Melville, Receiver, Electric Shovel Coal Corporation; P. L. Donie, vice president, Little Betty Mining Corp.; T. J. Thomas, president, Valier Coal Co.; Carl P. Hayden, general manager, Sahara Coal Co.; Fred S. McConnell, vice president, Enos Coal Mining Co.; R. E. Salvati, manager, Pond Creek Pocahontas Co.; W. J. Borries, general manager, Dawson Daylight Coal Co.; Jos. L. Osler, Receiver, Blackwood Coal & Coke Co.; F. M. Medaris, general manager, Harvey Coal Corp.; Pearl Bassham, vice president, Harlan-Wallins Coal Corp.; E. R. Price, superintendent, Inland Steel Co.; Milton H. Fies, vice president, Debardeleben Coal Corp.; L. E. Geohegan, vice president, Gulf State Steel Co.; Geo. H. Rupp, manager, Mining Department, Colorado Fuel & Iron Co.; H. H. Bubb, general superintendent, American Smelting & Refining Co.; Horace Moses, general manager, Gallup American Coal Co.;



**W. P. Vance**



**S. Tescher**



**Harry La Viers**



**B. H. Stockett**



**A. B. Kelley**



**T. F. Whalen**



**Rufus J. Ireland, Jr.**



**C. T. Hayden**



**E. R. Price**



**G. A. Knox**

Samuel Tescher, general superintendent, National Fuel Co.; J. M. Hughes, vice president, Northwestern Improvement Co.; G. A. Knox, superintendent, Gunn-Quealy Coal Co.; R. J. Ireland, Jr., assistant to president, Owl Creek Coal Co.; Otto Herres, assistant manager, U. S. Fuel Co.; B. H. Stockett, general manager, Weston Dodson Co. Inc.; R. E. Hobart, mechanical superintendent, Lehigh Navigation Coal Co.; A. B. Jessup, vice president, Jeddo-Highland Coal Co.

Information available at the headquarters of The American Mining Congress indicate that the attendance will be on a par with the record-breaking meetings of 1929 and 1930. Reports from Cincinnati's leading hotels indicate that they are booked to capacity. This is indeed a pleasing situation, and indicates many things: among them that the industry is not going down to defeat under the hammering of the Administration and the Labor Unions. The recently established wage scales, the shorter work day, the five day week have only served to renew mightily the interest of the industry in both modern method and equipment. Men are coming from the west, east, north and south to confer with fellow operators to discuss operating problems and to inspect the offerings of the manufacturers of mining machinery.



**R. E. Salvati**



**Milton H. Fies**



**Otto Herres**



**Thos. G. Fear**

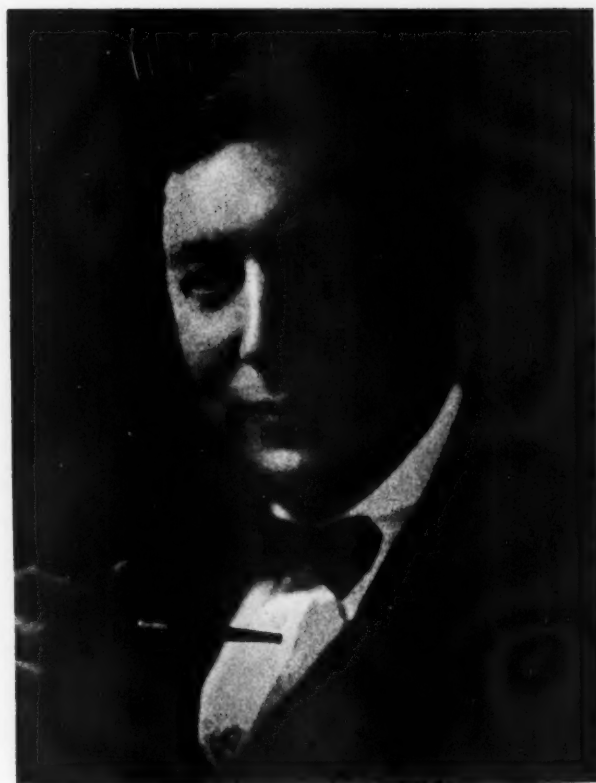


**W. J. Borries**



**HOWARD I. YOUNG**  
*President, The American  
Mining Congress. Mr. Young  
is President of the American  
Zinc, Lead & Smelting  
Company*

**R. L. IRELAND, JR.**  
*Chairman, Coal Division,  
American Mining Congress.  
Mr. Ireland is Vice President  
of the Hanna Coal Co.*







A. B. Jessup



Paul Weir



W. J. Jenkins

**The Coal  
Representatives  
on the Board  
of Directors of  
The American  
Mining Congress**



C. J. Ramsburg

The convention and exposition are under the direct auspices of the Coal Division, The American Mining Congress. R. L. Ireland, Jr., vice president, Hanna Coal Company, is national chairman, and A. J. Musser, vice president, Clearfield Bituminous Coal Corporation, is chairman of the Operators Section, and John T. Ryan, vice president, Mine Safety Appliances Company is chairman of the Manufacturers Section.

The division is composed of a membership of 62 operating coal companies, and 47 manufacturing companies. Its sole purpose is the development of Efficiency in Production Methods, and the data available through the reports of its numerous committees is a real contribution to operating practice. A major feature of its activities is this convention and exposition, where once each year all groups get together for a discussion of the problem and the plans developed for their solution.

The Convention will open on Monday morning, May 7, and will continue until Friday evening, with a completely diversified program for every session. Everything from blasting at the face, to cleaning will be presented by men of authority, and discussed by the leading men in the industry. A real feast is in store for the operating man.

The meeting will not be all seriousness. While the industry will be intent upon solving its production problems during the day, each evening will find a varied program of fun and entertainment, arranged by the host, The American Mining Congress. The special features of the entertainment follow: An "Ohio State Reception" will open the entertainment features for the week. This is under the auspices of the Cincinnati Coal Exchange, Mr. J. A. Reilly, Queen City Coal Co., Official Host, and will provide fun for everyone; for Tuesday night an Exhibitors' party has been arranged, under the direction of Mr. W. D. Turnbull, Westinghouse Elec. &



P. L. Donie



F. S. Pfahler



R. E. Hobart

Mfg. Co., known as "Our Gang at Sutter's Creek in 1849" reviving the "Salomy Jane" and Brete Harte days. Movies, dancing and special entertainment have been arranged for on Wednesday night; and outstanding in the entertainment program is the Annual Dinner and Dance, Thursday, May 10. All of the entertainment will be at the Hotel Netherland-Plaza. Other features include golf prizes, trophies for the best exhibits, and luncheons, auto trips, all making for a general good time in connection with the serious business in hand.

Entertainment is not exclusively for the gentlemen, but also for the ladies. Unusual, delightful and interesting affairs are being arranged by the distinguished Mrs. Arthur E. Bendelari, wife of the President of the Eagle Pitcher Lead Company. Mr. Bendelari also is a Director of The American Mining Congress. The special entertainment arranged by Mrs. A. E. Bendelari is as follows: Monday a Get-Acquainted luncheon in the Netherland-Plaza Hotel, Mrs. J. F. Callbreath, Hostess; Tuesday, a delightful tour of the beautiful hills of Kentucky followed by luncheon at the Summit Hills Country Club and a Musicale; Wednesday a visit to the

beautiful gardens of some of the interesting homes of Cincinnati, and a Tea to be served at the home of Mrs. Charles L. Harrison; and Thursday a luncheon at the well-known Cincinnati Country Club, Mrs. A. E. Bendelari, Hostess.

The Cincinnati Coal Exchange, through its president, Mr. Charles Chaplin, is taking an active interest in the welcoming of the guests. Mr. L. N. Thomas, chairman of the 1933 meeting, and vice president of the Carbon Fuel Company is the Chairman of the Committee on Arrangements and is arranging for a welcome to the delegates that it is said will rival the cordiality of the Pittsburgh meeting of 1933.

This Committee on Arrangements includes Mr. J. A. Reilly of the Queen City Coal Company and the Cincinnati Coal Exchange, heading the Reception Committee, Mr. Glenn Eddy, Ohio Brass Company, in charge of Publicity; Mr. G. M. Kearns, Geo. M. Kearns Coal Company, in charge of arrangement for Trips; Mr. Frank W. Moran, The Mining Congress Journal, in charge of Prizes; Mr. W. D. Turnbull, Westinghouse Elec. & Mfg. Co., who will be responsible for Entertainment features; Mr. G. M. Kearns and a Committee of Twelve from the Cincinnati Coal Exchange will be in charge



A. B. Jessup



T. J. Thomas



H. H. Bubb



L. N. Thomas



Mrs. A. E. Bendelari



W. D. Turnbull



C. H. Chaplin

of the Annual Dinner; and Mrs. A. E. Bendelari, Cincinnati, will be Hostess to the ladies and look after their entertainment. Mr. Charles Chaplin of the Cincinnati Coal Exchange is in charge of arrangements for Golf, and will be assisted by Mr. Jack Palmer of the Cincinnati branch of General Electric Company.

Mr. Glenn Eddy's services on Publicity have been made available to the convention through the courtesy of the Ohio Brass Company, Mansfield, Ohio, while the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., have made available the services of Mr. W. D. Turnbull, who in his inimitable way will handle the entertainment features of the convention; and Mr. L. W. Shugg has again been loaned to act as Director of Exhibits, once again insuring the ultimate in exposition management.

The Cincinnati Chamber of Commerce, through Mr. Mark Egan, Secretary of its Convention Bureau, is actively working with the local committees, as well as the national organization to bring out the best possible results.



A. J. Musser



Mark Egan



Glenn H. Eddy



Geo. M. Kearns



## Monday, May 7

10:00 A. M.

**CHAIRMAN: PAUL WEIR**

*Vice President, Bell & Zoller Coal & Mining Co.*

### INTRODUCING:

**HOWARD I. YOUNG**

*President, The American Zinc, Lead & Smelting Company. President, The American Mining Congress.*

**C. M. LINGLE**

*Vice President, The Buckeye Coal Co.  
National Chairman, Program Committee.*

**R. L. IRELAND, JR.**

*Vice President, Hanna Coal Co.  
Chairman, Coal Division, A. M. C.  
"Facing the Future with the Coal Industry."*

**JOHN T. RYAN**

*Vice President, The Mine Safety Appliances Co.  
Chairman, Manufacturers' Section, A. M. C.  
"How the Manufacturers Are Aiding the Coal Industry in Solving Their Production Problems."*

### UTILIZATION INVESTIGATIONS

**E. J. KERR**, *Combustion Engineer, Lorain Coal & Dock Co.*

### ANNOUNCEMENTS:

12:30 P. M.—LUNCHEON

### COAL ASSOCIATION EXECUTIVES

2:30 P. M.

**CHAIRMAN: E. J. CHRISTY**

*Cons. Engr., The Wheeling Township Coal Mng. Co.*

### REVIEW OF MECHANIZED MINING

**G. B. SOUTHWARD**, *Mining Engineer, The American Mining Congress.*

### COMPARATIVE RESULTS IN WET AND DRY WASHING

**T. W. GUY**, *Cons. Engr., Charleston, W. Va.*

### DISCUSSION:

**A. F. CASTANOLI**, *Prep. Mgr., Koppers Coal Co.*

### PROMOTION OF SAFETY EDUCATIONAL WORK THROUGH SAFETY MEETINGS

**E. B. AGE**, *Supt., Dehue Mines, The Youngstown Mines Corp.*

### DISCUSSION:

**F. S. LENHART**, *Safety Director, W. J. Rainey, Inc.*

### REVIEW OF NEWEST THINGS IN EQUIPMENT FIELD

**PETER F. LOFTUS**, *Cons. Engr., Pittsburgh, Pa.*

8:00 P. M.

### OHIO STATE RECEPTION AND DANCE

*Pavilion Caprice, Netherland Plaza Hotel,  
Cincinnati Coal Exchange, Hosts.*

## Tuesday, May 8

10:00 A. M.

**CHAIRMAN: M. D. COOPER**

*Division General Supt., Hillman Coal & Coke Co.*

### COSTS AS RELATED TO MINING

**CAREL ROBINSON**, *Gen. Mgr., Kelley's Creek Colliery Co.*

### VARIOUS METHODS OF ROOF SUPPORT

**A. R. JOYCE**, *Cons. Engr., Marietta, Ohio*

### COAL SAW TESTS AT MINES OF C. C. B. SMOKELESS COAL CORP.

**ALBERT EVANS**, *Div. Engr., C. C. B. Smokeless Coal Co.*

### GATHERING LOCOMOTIVE HAULAGE

**JOHN H. RICHARDS**, *Chf. Mng. Engr., Hanna Coal Co.*

### CONSTRUCTIVE SAFETY WORK

**E. L. BERGER**, *G. S., Bell & Zoller Coal & Mng. Co.*

### DISCUSSION:

**M. L. COULTER**, *Chf. Engr., Clearfield Bit. Coal Corp.*

### VARIOUS METHODS OF SHOOTING COAL IN THE HARLAN FIELD

**PEARL BASSHAM**, *V. P., Harlan-Wallins Coal Corp.*

# PROGR

## THE AMERICAN MINING CONGRESS PRACTICAL COAL

Music Hall, Cincinnati

### DISCUSSION:

**J. M. JOHNSTON**, *Chf. Engr., Bell & Zoller Coal & Mng. Co.*

**L. T. PUTMAN**, *G. S., Raleigh Wyo. Mining Co.*

12:30 P. M.—LUNCHEON

**COMMITTEE CHAIRMEN**, *Coal Division A. M. C.*

2:00 P. M.

**CHAIRMAN: L. EPPERLY**

*Vice Pres., Winding Gulf Collieries*

### MECHANICAL LOADING OF SLATE IN ENTRIES AND AIRCOURSES

**C. W. GIBBS**, *Gen. Mgr., Harwick Coal & Coke Co.*

### DISCUSSION:

**ROBT. G. PFAHLER**, *Mng. Engr., The Rev-  
wind-White Coal Mng. Co.*

**FRANK B. DUNBAR**, *Mgr., Mather Collieries.*

### SCOURING DEVICE FOR REMOVING DISCOLORATIONS FROM COAL AND RESTORING ORIGINAL LUSTER

**T. M. DODSON**, *Vice Pres., Weston Dodson & Co., Inc.*

### PRESENTATION OF JOS. A. HOLMES SAFETY ASSOCIATION CERTIFICATE OF AWARD TO PINE HILL COAL CO.

**SCOTT TURNER**, *Director, U. S. Bureau of Mines*

### CLEANING OF STRIP MINE COAL IN THE SOUTHWEST

**K. A. SPENCER**, *V. P. and G. M., The Pitts-  
burg & Midway Coal Mng. Co.*

### DRILLING AT THE ENOS COAL MINING COMPANY

**C. R. BARNARD**, *Chf. Engr., The Enos Coal Mng. Co.*

### DISCUSSION:

**J. B. F. MELVILLE**, *Electric Shovel Coal Corp.*

4:00 P. M.

### ANNUAL MEETING

*Board of Governors, Coal Division, A. M. C.*

8:00 P. M.

### A NIGHT WITH "OUR GANG" IN SUTTER'S CREEK IN 1849

*Netherland Plaza Hotel. Under the direction  
of W. D. TURNBULL, Chairman.*

## Wednesday, May 9

10:00 A. M.

**CHAIRMAN: T. D. LEWIS**

*Gen. Supt., Lehigh Navigation Coal Co.*

### WET CLEANING OF SMALL SIZES OF ANTHRACITE

**B. C. OSLER**, *Gen. Mgr., Pardee Bros. & Co., Inc.*

### USE OF GUNITE FOR ROOF CONTROL

**C. E. HOUGH**, *Engr. Dept., Federal Coal & Coke Co.*

### DISCUSSION:

**JOHN H. RICHARDS**, *Chf. Mng. Engr., Hanna Coal Co.*

### EFFICIENCY IN USE OF ELECTRICAL POWER IN MINING

**M. W. HORGAN**, *Mining Representative, Monongahela West Penn Public Service Co.*

### DISCUSSION:

**W. P. VANCE**, *G. S., Butler Cons. Coal Co.*

**C. C. BALLARD**, *Master Mechanic, The New River Co.*

**CARL LEE**, *Elec. Engr., Peabody Coal Co.*

# PROGRAM

RESSE  
COAL  
innati,  
Ohio, May 7-11, 1934

## EFFECT OF COAL CODE UPON SAFETY AND DISCIPLINE

C. F. KECK, *Mine Inspector, Jamison Coal & Coke Co.*

### DISCUSSION:

W. L. AFFELDER, *V. P., Hillman Coal & Coke Co.*

2:00 P. M.

**CHAIRMAN:** DR. L. E. YOUNG  
*Vice Pres., Pittsburgh Coal Co.*

## COAL SAMPLING

D. A. RUSSELL, *Chf. Chemist, The Youngstown Sheet & Tube Co.*

### DISCUSSION:

M. H. FORESTER, *Prep. Mgr., The Consolidation Coal Co.*

## CAPACITY OF MINE CARS AND THEIR RELATION TO MECHANICAL LOADING

I. N. BAYLESS, *Asst. Gen. Mgr., Union Pacific Coal Co.*

## PREPARING COAL AT POND CREEK POCAHONTAS MINE No. 4

F. C. CAROTHERS, *Asst. to Mgr., Pond Creek Pocahontas Co.*

## PROTECTIVE CLOTHING AND SAFETY IN THE ANTHRACITE COAL FIELD

C. G. BREHM, *Supervisor of Safety and Compensation, Susquehanna Collieries Co.*

## MINING COMPANY TOWN—ITS GOVERNMENT—ITS SANITATION—ITS SOCIAL OUTLOOK AND THE IDEAL IT SHOULD REPRESENT

WM. BEURY, *Vice Pres., Algoma Coal & Coke Co.*

W. A. BORRIES, *Mng. Engr., Dawson Daylight Coal Co.*

(Following above presentations, a series of slides will be shown, covering interesting mining camps in the various coal-producing districts.)

4:00 P. M.

## ANNUAL MEETING

MANUFACTURERS' SECTION, Coal Division, A.M.C.

8:00 P. M.

## SPECIAL FILM AND OTHER ENTERTAINMENT

Dancing to Paul Pendarvis' Famous Morieland Orchestra. Hall of Mirrors, Netherland Plaza Hotel.

## Thursday, May 10

10:00 A. M.

**CHAIRMAN:** EUGENE MCAULIFFE  
*President, Union Pacific Coal Co.*

## EFFICIENT HAULAGE SYSTEM

E. H. JENKS, *Division Engineer, Rochester & Pittsburgh Coal Co.*

### DISCUSSION:

HUGO NYQUIST, *Engr., Hudson Coal Co.*

A. B. JESSUP, *Vice Pres., Jeddo-Highland Coal Co.*

R. J. OLDHAM, *Supt., Centralia Coal Co.*

PAUL STERLING, *Mech. Engr., Lehigh Valley Coal Co.*

## PROMOTING SAFETY AS A SOUND INVESTMENT

JAS. F. BRYSON, *Director of Safety, Harlan County Coal Operators' Association.*

WM. ROY, *Safety Director, Hanna Coal Co.*

### DISCUSSION:

DR. J. J. RUTLEDGE, *Chief Mine Engr., Maryland Bureau of Mines.*

## LATEST PRACTICE AND RESULTS IN DE-DUSTING

ARTHUR F. NESBIT, *Cons. Engr., Wilkinsburg, Pa.*

### DISCUSSION:

JOHN R. FENTON, *Vice Pres., J. K. Dering Coal Co.*

## SOME ADVANTAGES AND PROBLEMS OF MULTIPLE SHIFTING

F. S. FOLLANSBEE, *Chf. Engr., Koppers Coal Company.*

### DISCUSSION:

D. D. DODGE, *V. P., W. J. Rainey, Inc.*

H. A. TREADWELL, *G. S., Chicago, Wilmington & Franklin Coal Co.*

## USE OF MOUNTED CUTTING MACHINES

D. D. WILCOX, *Gen. Supt., Superior Coal Co.*

### DISCUSSION:

GEORGE F. CAMPBELL, *V. P. chg. Op., Old Ben Coal Corp.*

## 12:00 NOON—LUNCHEON MEETING

BOARD OF DIRECTORS, A. M. C.

2:00 P. M.

**CHAIRMAN:** P. C. THOMAS  
*Vice Pres., Koppers Coal Co.*

## AIR SHOOTING—AN ENTIRELY NEW PROCESS

C. J. SANDOE, *Vice Pres., West Virginia Coal Co. of Missouri.*

### DISCUSSION:

A NEW METHOD OF BREAKING DOWN COAL AT THE FRANKLIN COUNTY COAL CORPORATION

FRED A. MILLER, *Franklin County Coal Co., Inc.*

## NEW COAL PROCESSING PLANT AT THE BINKLEY COAL COMPANY

WALTER E. RUTLEDGE, *Vice Pres., Binkley Coal Co.*

## METHOD OF SHAKING CONVEYOR MINING IN GUNN-QUEALY COAL CO. MINES

G. A. KNOX, *Supt., Gunn-Quealy Coal Co.*

### DISCUSSION:

H. A. TREADWELL, *G. S., Chicago, Wilmington & Franklin Coal Co.*

T. J. THOMAS, *Pres., Valier Coal Co.*

H. B. HUSBAND, *G. M. of Coal Mng., Chesapeake & Ohio Ry. Co.*

J. D. ROGERS, *V. P. and G. M., Stonega Coke & Coal Co.*

T. F. MCCARTHY, *G. S., Clearfield Bituminous Coal Corp.*

I. N. BAYLESS, *Asst. Gen. Mgr., Union Pacific Coal Co.*

G. S. JENKINS, *Mech. Engr., Consolidated Coal Co. of St. Louis.*

## 6:30 P. M.—INFORMAL DINNER-DANCE

Hall of Mirrors, Netherland Plaza Hotel  
Toastmaster, RALPH E. TAGGART, *Vice Pres., Stonega Coke & Coal Co.*

## Friday, May 11

10:00 A. M.

**CHAIRMAN:** ROBT. J. SMITH  
*President, Princeton Mining Co.*

## STRIPPING OPERATIONS AT COLSTRIP, MONTANA

D. R. SWEM, *Mng. of Coal Operations, Northwestern Improvement Company.*

## SHAKER CONVEYORS AND THEIR ADOPTION TO 22 DEGREE PITCH

P. H. BURNELL, *Supt., Owl Creek Coal Co.*

### DISCUSSION:

W. D. BRYSON, *G. S., Colony Coal Co.*

## SAFETY IN THE NEW RIVER DISTRICT

CHARLES E. VAWTER, *Asst. Engr., Gauley Mt. Coal Co.*

## SAFETY PRACTICES IN ALABAMA COAL MINES

O. V. SIMPSON, *Safety Director, Alabama By-Products Corp.*

## MOVING PICTURE OF MODERN MINING METHODS AT CONSOLIDATED COAL CO. OF ST. LOUIS

(Covering Cutting, Shearing, Drilling, Loading, Haulage and Cleaning)

2:00 P. M.

**SPECIAL TRIP—To Fuel Utilization Plant, Union Gas and Electric Co. In charge: CINCINNATI COAL EXCHANGE.**

# THE EXPOSITION of COAL MINE EQUIPMENT



**JOHN T. RYAN**

*Chairman of the Board of Governors,  
The Manufacturers Section, Coal Division,  
The American Mining Congress*

**T**HE Eleventh Annual Exposition will be a marvel of efficiency and interest. Represented on the floor will be ninety or more of the most representative manufacturers of mining machinery and supplies. Their exhibits will occupy better than 30,000 square feet of floor space. Everything of interest in production problems will be presented. Manufacturers of bearings; cutting and shearing machines; drilling equipment; electrical equipment and supplies; explosives; haulage equipment and supplies; hoists and dumps; lamps; loaders, scrapers and conveyors; lubricants; power transmission apparatus; preparation systems and equipment; trade paper publishers; pumps; safety equipment; testing and weighing equipment; ventilation equipment; wire rope. The United States Bureau of Mines will present its story through an exhibit sponsored by the National Committee for the Bureau, of The American Mining Congress.

Leading manufacturers, recognizing the need of the industry at this critical period are putting forth great effort to bring to the operator's attention those things that they have to offer that will serve them. This is evidenced by such tremendous exhibits as the Jeffrey Manufacturing Company, who will be represented in the exposition with 2000 square feet of floor space; Sullivan Machinery Co. with 1400 square feet of space; the Joy Mfg. Company with 600 square feet; the Goodman Manufacturing Company with 800 square feet; the Myers Whaley Company with 300 square feet; the Westinghouse Electric & Manufacturing Co. with 600 square feet; and the General Electric Company with 800 square feet. The United States Steel group, including the Carnegie Steel Co., will utilize some 1,000 square feet, with the



Ohio Brass Company, the Timken Roller Bearing Company, Roberts & Schaefer Company, the Enterprise Wheel & Car Corporation, the National Carbon Company, the New Departure Company, the Sanford Day Iron Works, and the Mine Safety Appliances Company occupying space varying from 200 to 400 square feet. The Safety Mining Company will display their new air shell and will utilize 500 square feet of space. In all, there are some 89 companies taking approximately 30,000 square feet of floor space.

The Exposition is sponsored by the Manufacturers Section of the Coal Division, The American Mining Congress, and is thoroughly representative of this important phase of the industry.

#### THE EXHIBITORS

The following firms will exhibit (A special write-up of all exhibits on the floor will be presented as a feature of our June issue):

Ahlberg Bearing Co.  
American Brattice Cloth Co.  
American Cable Co.  
American Mine Door Co.  
American Sheet & Tin Plate Co.  
American Steel & Wire Co.  
Atlas Powder Co.  
Baldwin Locomotive Works  
Bethlehem Steel Co.  
Brown-Fayro Co.  
Carnegie Steel Co.  
Cheatham Electric Co.  
Chicago Pneumatic Tool Co.  
Cincinnati Mine Machinery Co.  
Coal Mine Equipment Sales Co.  
Coal Mining  
Columbia Alkali Corporation  
Duncan Fdry. & Machine Works  
E. I. du Pont de Nemours & Co., Inc.  
Edison Storage Battery Co.  
Electric Railway Equipment Co.  
Electric Rwy. Improvement Co.  
Electric Storage Battery Co.  
Enterprise Wheel & Car Co.  
Fafnir Bearing Co.  
Flood City Brass & Electric Co.  
General Electric Co.  
General Explosives Corp.

General Steel Castings Co.  
Goodman Mfg. Co.  
Gulf Refining Co.  
Hendrick Mfg. Co.  
Hercules Powder Co.  
Hulburt Oil & Grease Co.  
Hydrotator Co.  
Joy Mfg. Co.  
Jeffrey Mfg. Co.  
Koppers Rheolaveur Co.  
Liberty Powder Co.  
Link Belt Co.  
Leschen & Sons Rope Co., A.  
Lehigh Safety Shoe Co.  
Lorain Steel Co.  
McGraw Hill Publishing Co.  
McNally-Pittsburgh Mfg. Co.  
Macwhyte Co.  
Miner Co., W. H.  
Mine Safety Appliances Co.  
Mining Congress Journal  
Morrow Mfg. Co.  
Myers-Whaley Co.  
Nachod & U. S. Signal Co.  
National Carbon Co., Inc.  
National Malleable & Steel Castings  
New Departure Mfg. Co.  
Norma-Hoffmann Bearings Corporation  
Ohio Brass Co.  
Penn Machine Co.  
Penna. Electric Repair Co.  
Phillips Mine & Mill Supply Co.  
Portable Lamp & Equipment Co.  
Post-Glover Electric Co.  
Princeton Foundry & Supply Co.  
Pure Oil Co.  
Roberts & Schaefer Co.  
Robins Conveying Belt Co.  
Roebing's Sons Co., John A.  
Robinson Ventilating Co.  
Safety First Supply Co.  
Safety Mining Co.  
Sanford-Day Iron Works, Inc.  
Standard Oil Co.  
Streeter-Amet Co.  
Sullivan Machinery Co.  
Sun Oil Co.



**L. W. Shugg**

Director of Exhibitors

(Courtesy of the General Electric Company)

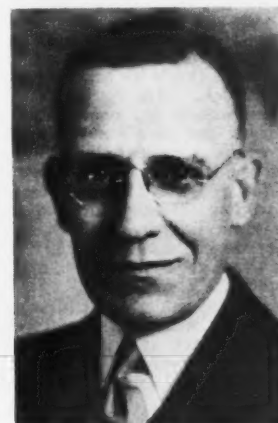
Texas Co., The  
Timken Roller Bearing Co.  
Toledo Scale Co.  
Tool Steel Gear & Pinion Co.  
Tracy Co., Bertrand P.  
Tyler Co., The W. S.  
Tyson Roller Bearing Co.  
Universal Lubricating Co.  
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MAY, 1934

# EFFICIENT COAL MINE HAULAGE

By H. B. HUSBAND \*

**T**HE shorter working day and week give transportation a new significance. Transportation has always been one of the important factors in successful coal mining, but now we must organize our system and our organization so that delays, wrecks and confusion are eliminated. There are a good many ideal transportation systems hidden away in some one's mind, some one who, perhaps, is so modest that he keeps his ideas a secret. We must be neighborly; if you have a good idea pass it on. There is plenty of business for everyone if we work together. If we must fight, let's fight competitive fuels. The purpose of the committee on transportation research is to collect what is new and vital in transportation and pass it on to those who wish to progress.

The weight of the rail and the size of the locomotive can be figured by established formulas and we all know that the greatest number of cars any locomotive can deliver to the tippie is the greatest it can pull up the heaviest grade on the line. The plan of the transportation system must take grades, curves and drainage into consideration, but no matter how well a system is planned or how heavy the rails or locomotive, it will only stay in successful operating conditions as long as it is maintained.

We must go to the extreme in inspecting main lines. The light from the average locomotive will do, but someone with initiative must see conditions and see that defects are corrected before they cause trouble. In a coal mine with just a few miles of main line, an inspection car with headlights on it is justified and regardless of anyone's opinion, without good track we cannot have good transportation. Of course, there are limits as to how far one should go on track work for in some of the mining areas where long, narrow ridges are worked and the life of each section is only a few years at the most, temporary track, well maintained, is sufficient, but on the main line, over which each ton of coal produced must move, heavy rails, heavy ties, good drainage and good alignment are essential.

There is considerable difference of opinion as to what is the most efficient type of mine car and this is a difficult question to answer, as there are a great number of factors entering into the design of cars. The design that is good

under one condition might not be suitable under another condition, but the definite trend is toward larger cars and cars of more or less rigid construction. This is a subject which needs a great deal of careful and intelligent study and investigation.

No matter how good the track nor how fine the equipment, the operating men must be intelligent, industrious and friendly. Just any type of a workman is not suitable in transportation. They must not be "chance takers," and must have mechanical aptitude and be courageous. Rigid discipline must be maintained and by rigid I do not mean the "do it or get out type." What we must have is clear and concise rules of procedure and above all, a foreman who knows his business, for the men cannot respect and follow a blunderer.

Motormen should be held responsible for the care of their locomotives and a simple system of written reports should be used so that the condition of the locomotive can be reported in writing to the repairman. A simple follow-up system must be used so that the foreman will know what has been done about each defect reported. Serious breakdowns will never occur if the little defects are attended to in time. Burning of armatures and field coils, scarring of commutators, sand in the gears and journals or lack of lubrication can no longer be thought of, much less tolerated. The brakemen must be instructed that mine cars are an important part of the haulage equipment and that they are responsible and must not permit the ramming, smashing and "stop where they hit" pastime that has been so popular in the past. Both the motormen and the brakemen must be thoroughly trained that wrecks and derailments are bad management, not bad luck. They should be required to report bad track, bad timber, bad doors, etc., whenever they see them. It requires some diplomacy on the part of the foreman to get one workman to report conditions which reflect on another workman, but

the reporting of these conditions, unless it be a case of flagrant neglect on the part of the trackman, timberman, or bratticeman, need not call for disciplinary action, for oftentimes the workmen involved are not responsible. By a friendly attitude you can get the motor crews and the other maintenance men to co-operate and help each other. The accidents in transportation can, and this is no idle statement, be eliminated. If accidents persist it is because someone is falling down on the job.

The dispatcher must have a keen, clear and accurate knowledge of every part of the mine and must have the courage when emergencies or unusual conditions arise to give necessary orders to clear up the situation. Motormen and brakemen are quick to appreciate a dispatcher who knows his business and accordingly respect his judgment and continually give him information that enables him to make decisions. It is possible through a dispatcher, to so regulate the gathering locomotives that they travel on schedule and every coal loader knows when to expect his empty car and when to expect the loaded car to be pulled. The coal loader is able to arrange his dead-work, such as gobbing, timbering, etc., to suit the schedule of the gathering locomotive and knowing what time to expect the locomotive, he, the loader, will always have his car loaded.

Scheduled operations make for increased safety, because the loader is never prone to load the car and set the post afterward. He need not hurry as he knows when the motor will be back. When gathering locomotives are operated on schedule the main line can be so handled as to have the empties at the parting when the gathering locomotive gets there, and no time need be lost by one waiting for the other. This is not a vision, but is a practical idea that is being carried out.

We must realize that each mine car is a distinct unit and must be accounted for. Each car should be numbered in large, legible numbers on each side to establish its identity. One of the surprising things in the study of transportation is the fact that some mine cars come to the tippie three or four times a day, while other cars appear but once in two days. By studying the movements of the cars, one is able to pick out and remedy defects in the transportation system which otherwise would remain hidden.

(Concluded on page 70)

\* Gen. Mgr., C. & O. Fuel Mines; Chairman of Committee on Transportation, Coal Division American Mining Congress.

# THE EFFECTS OF 64.64c SILVER ON THE VALUE OF COPPER ORES

By ELMER W. PEHRSON\*

THE recent establishment of an official price of 64.64 cents per ounce for silver by the President's order of December 21, 1933, has provoked discussion as to the effects of this move on the various metal-mining industries. To assist those of the mineral industry who are interested in this problem, the Bureau of Mines presents the following analysis of basic statistical data concerning the relation of the silver price to the value of copper ores mined in the United States. The term "copper ore," as used herein includes all ores in which copper is the most abundant base metal paid for. In 1928, this class of ore contributed 98 per cent of the total copper output of the United States.

## STATISTICAL SUMMARY

1. From 1907 to 1932, the average silver yield per pound of copper produced from copper ores ranged from a high of 0.01658 ounce in 1909 to a low of 0.00839 ounce in 1928. The value of this silver ranged from 1.21 cents per pound in 1919 to 0.25 cent in 1932.

2. A 64.64-cent silver price would have increased the average silver revenue per pound of copper, as follows:

1928—from 0.49 to 0.54 cent, or 0.3 percent of the average copper price.

1929—from .49 to .60 cent, or .6 percent of the average copper price.

1930—from .39 to .65 cent, or 2.0 percent of the average copper price.

1931—from .27 to .61 cent, or 3.7 percent of the average copper price.

1932—from .25 to .58 cent, or 5.2 percent of the average copper price.

3. The silver yield from copper ores declined 66 per cent, from 1907 to 1928, whereas the copper yield declined only 33 per cent.

4. The silver revenue per ton of copper ore declined from 46 cents in 1907 to 8 cents in 1931.

5. The silver revenue amounted to a maximum of 7.5 percent of the total revenue from copper ores in 1922 and a minimum of 2.7 percent in 1929.

6. The silver revenue per pound of copper in 1928 amounted to only 3 percent of the average selling price of copper, but was equivalent to 11 percent of

the average profit computed without allowance for depletion.

7. The 64.64-cent silver price will benefit the producer of nonporphyry copper in the west more than the producer of porphyry copper. Had this price prevailed in 1931 the silver yields would have been 1.47 cents per pound of nonporphyry copper and 0.12 cent per pound of porphyry copper, an advantage of 1.35 cents per pound in favor of the producer of nonporphyry copper.

8. A 64.64-cent silver price in 1932 would have increased the average recoverable value of all copper ores from \$2.61 to \$2.73 per ton, an increase of 12 cents per ton, or 4.6 percent.

9. In 1932, the year in which the average price of silver was the lowest on record, the maximum increase that would have been effected by a 64.64-cent silver price in any of the 24 principal copper-producing districts of the United States was \$1.24 per ton; in 11 districts, producing 61.8 percent of the total copper, the increase would have been only 5 cents or less per ton; and only in 5 districts, contributing 31.8 percent of the copper, would the increase in value have amounted to 50 cents or more per ton of ore mined.

10. The Butte, Verde (Jerome), Bisbee, Bingham and Pioneer (Superior, Ariz.) districts alone accounted for 82.4 per cent of the total silver derived from copper ores in 1928.

11. In 1928 only 6 of the 24 principal copper-producing districts produced copper ores from which the silver yield would have been 1 cent or more per pound of copper, had silver been valued at 64.64 cents.

## CONCLUSIONS

Consideration of the magnitude of the changes effected in the value of copper ores by 64.64-cent silver leads to the conclusion that the new silver price will have little ultimate effect on the copper-mining industry of the United States. Assuming the return of a normal demand for copper supplied by domestic

production, the following deductions seem warranted:

1. Copper production from the high-silver districts will not be stimulated by the new silver price to a point where stocks of copper will be increased further.

2. Production of by-product silver from copper ores will not be increased greatly.

3. The geographical distribution of copper production in the United States will not be altered materially.

Stimulation of copper production, with resultant increase in copper stocks, probably would not occur if the production quotas specified in the proposed Copper Code are carried out. But even assuming that there were no control over production, there seems to be no basis for concluding that the new silver price of itself would result in any substantial increase in copper production. Consider the situation in November, 1933, just before the new silver price was established. During that month the average price of copper was 7.9 cents per pound and that of silver 43 cents an ounce. Had silver been valued at 64.64 cents an ounce, the maximum additional revenue per pound of copper in any of the 24 principal producing districts would have been about 0.5 cent; in only eight districts, which in 1928 produced less than a third of the total copper, would it have amounted to 0.2 cent or more. Thus an increase of only 0.5 cent per pound in the price of copper would have accomplished the same increase in revenue, even in the districts with the highest silver yield, and an increase of 0.2 cent in copper price would more than offset the effects of 64.64 silver in districts producing two-thirds of the copper. It is, therefore, apparent that the additional revenue created by the newly established silver price could be wiped out by a comparatively small drop in the price of copper. Under these circumstances it seems unreasonable to suppose that producers of copper ores of high silver content will adopt a policy of realizing larger revenue from silver by increasing production at the risk of again increasing copper stocks and upsetting the copper price. The absence of any outstanding relation in the past between the trends of silver price

(Continued on page 63)

\* Mineral Economist, U. S. Bureau of Mines.



# ACCIDENT RECORD

## of the

# PHELPS DODGE CORPORATION

By H. C. HENRI \*

**A**CCIDENT prevention work has made noteworthy progress in the mining industry during the past ten years. During this period there has been a pronounced increase in safety activity throughout the industry, which has resulted in a gratifying decrease in the industrial accident rate. However, the outstanding accomplishment has been the marked improvement in the character and effectiveness of accident prevention work, as evidenced by the number of outstanding safety records, which have been established by individual coal and metal mining companies. Much of the progress during this period is undoubtedly due to a better understanding and application of the fundamentals underlying successful safety work, and to the development of an improved technique. The trend toward improved practice indicates that accident prevention work in the mining industry is gradually emerging from its adolescent stage.

Although mining is regarded as an especially hazardous industry, many mines, including those of the Phelps Dodge Corporation, have established safety records which would be a credit to less hazardous industries. There have been made available during recent years so many remarkable safety records by individual coal and metal mining companies<sup>1</sup> that it is now definitely demonstrated that accident prevention work, when properly organized and administered, will result in making mining operations as safe as the majority of other industrial activities.

Accident prevention work at the properties of the Phelps Dodge Corporation was inaugurated in the year 1913. In 1925, the plan of administering the work was reorganized, since it was evident that after many years of continuous effort to eliminate accidents, little permanent improvement had been made.

The present plan of safety organization and the principal methods used in administering the work have been discussed in detail in several papers published in recent years.<sup>2</sup> The purpose of

this discussion is to present the results which have been secured and to mention some of the methods which have been particularly successful in bringing about a very gratifying reduction in the accident rate of the corporation.

The results achieved during the past nine years at the coal and metal mining properties of the corporation are, to a very large extent, due to the active participation of the management in the accident prevention program, and to the sincere belief on the part of those officials who control the policies of the corporation and direct its operations, that practically all industrial accidents are preventable.

Accident prevention work has been made a major operating problem. Operating officials are held responsible for safety as well as for production results and are charged with the responsibility of administering accident prevention work in their respective departments.

The present plan of safety organization is designed to bring everyone in the organization — managers, superintendents, foremen, bosses and workmen — into direct contact with the safety program, and has resulted in bringing about what we believe to be a safety-conscious organization.

The accident experience of the corporation, covering a period of more than 21 years, demonstrates very clearly that complete and accurate information covering the accident experience of the various departments and operations is necessary to intelligent and effective administration of accident prevention work. The policy of insisting that all accidents be reported, investigated and analyzed, and that the conditions responsible for the accident be promptly corrected, has been one of the important factors in bringing about the results which have been secured. All personal injuries, no matter how slight the injury may be,

and all accidents, including non-injury cases, must be promptly reported.

Accident cases naturally divide themselves into two major groups: Disabling and non-disabling accidents. If the injured employee is unable to report for work the shift immediately following the accident, the accident is classified as a "lost time," or disabling accident.

For a number of years it has been the practice to require employees who sustain an injury to secure a written release from the medical department, which they must present to their foreman before they are allowed to return to work. The chief surgeon at each plant is held responsible for the proper enforcement of this policy, and is the sole judge as to when an injured employee may resume his duties.

Generally speaking, accident prevention efforts must be preceded by and based upon a thorough analysis of past accidents and their causes. By analysis of an accident, we mean a study of the job being done at the time of the accident, a survey of the equipment used, the method of preparing for the work, and the personnel involved. It has been our experience that operating, as well as safety practice, can be improved through the analysis of accidents, since proper analysis reveals the defects (mechanical or human) that exist within an organization, and the reasons for their existence. For this reason, our departmental safety committees are required to investigate and analyze every accident occurring in the department. The findings of these committees are reviewed by the plant general safety committee.

We believe that it is extremely important that accidents as well as personal injuries be reported. It is now generally recognized that an accident is the result of a train of circumstances or conditions which may occur many times without an injury, and that the injury is simply the result of the accident. It has only been in recent years that the significance of this distinction has been realized by our safety committees.

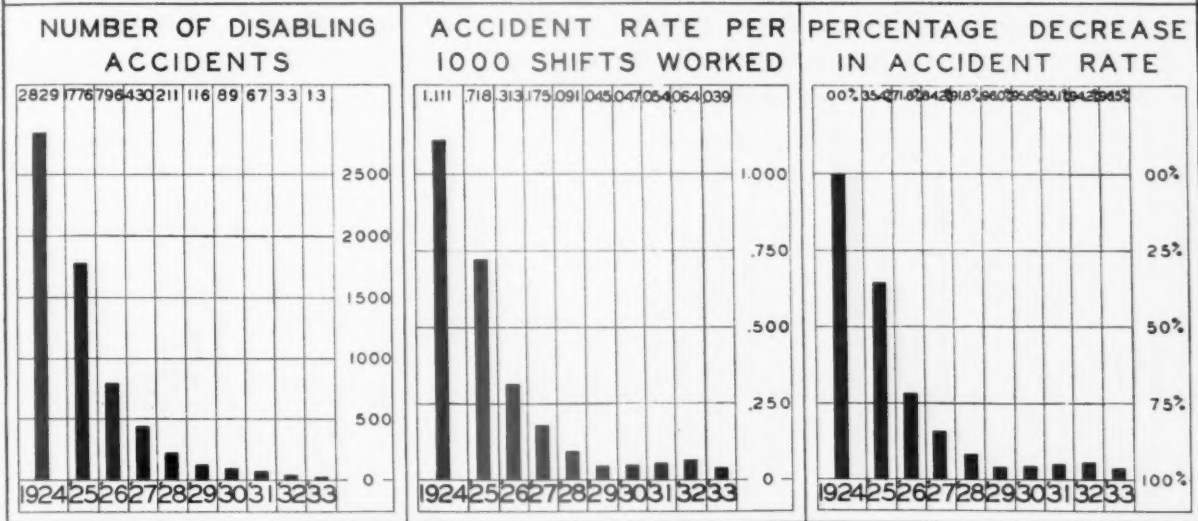
In every mine, there occurs at rather frequent intervals, minor falls of ground,

\* Mgr. Safety Dept., Copper Queen Branch, Bisbee, Ariz.



# ACCIDENT RECORD

PHELPS DODGE CORPORATION AND OLD DOMINION COMPANY  
YEARS 1924 - 1933

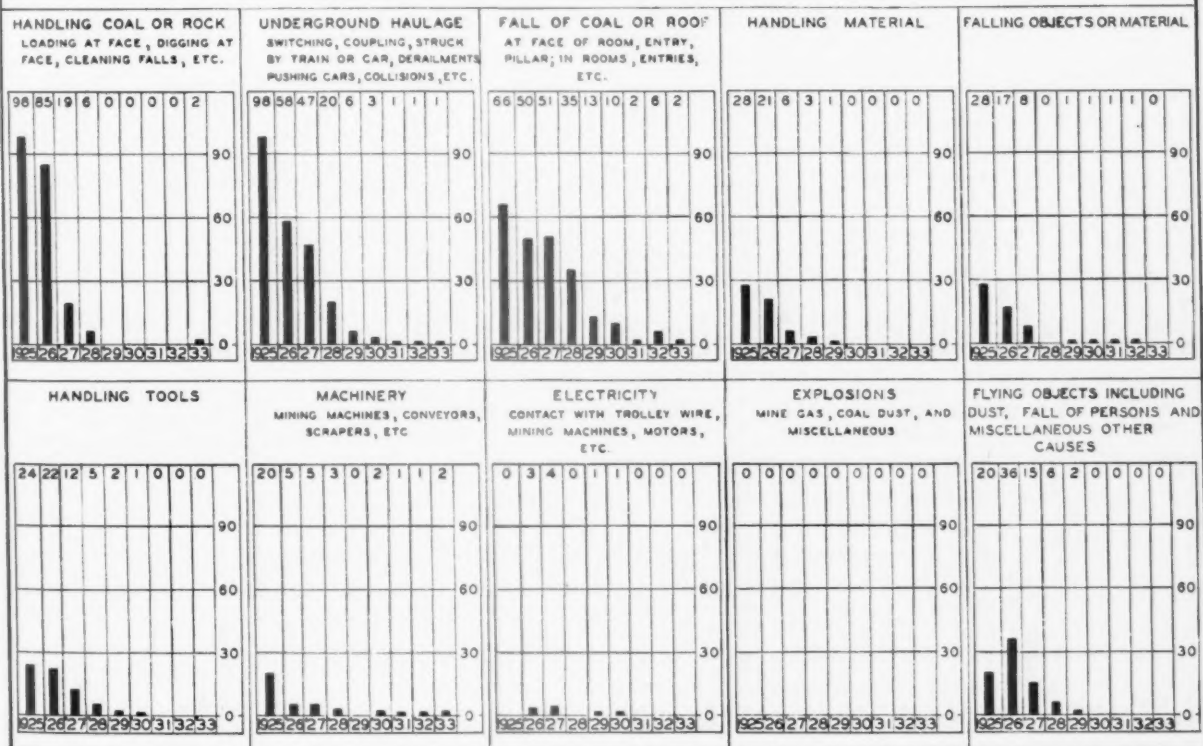


## CLASSIFICATION OF DISABLING ACCIDENTS

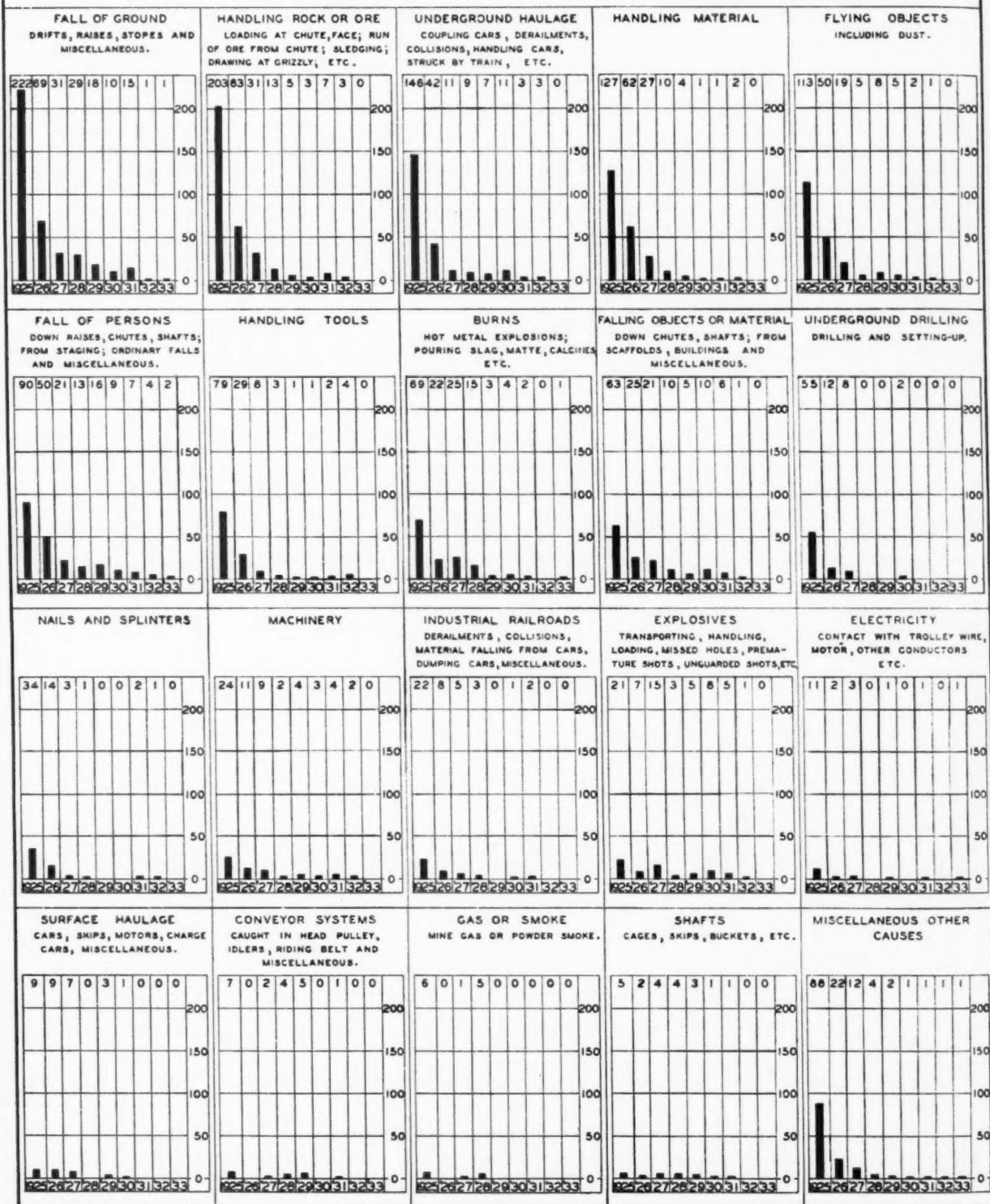
AS TO CAUSE. YEARS 1925-1933.

COAL MINING OPERATIONS.

PHELPS DODGE CORPORATION.



# CLASSIFICATION OF DISABLING ACCIDENTS AS TO CAUSE. YEARS 1925-1933. METAL MINING, MILLING AND SMELTING OPERATIONS. PHELPS DODGE CORPORATION AND OLD DOMINION COMPANY.



derailments of mine cars, runs of ore or waste at chutes or grizzlies, and many other similar occurrences in which no one is injured and of which no particular report is made. These occurrences generally indicate that something is wrong either in equipment or practice, and that the defect unless remedied will sooner or later result in a disabling accident. By insisting that these occurrences, which may be termed minor accidents, be reported and analyzed, an opportunity is afforded to correct unsafe conditions and practices before a disabling injury occurs.

After accidents have been investigated and analyzed, they are classified both as to responsibility for the accident, and to the operation or condition contributing to the accident. The segregation of accidents as to operations is especially helpful in that it gives definite information as to the operations responsible for the majority of the accidents, and consequently shows where practice or methods must be improved.

The accident statistics of the corporation presented in this discussion cover a very diversified group of operations and include mining operations (both surface and underground), milling, smelting and the usual surface service departments, including construction. The coal mining properties are gaseous mines with bad roof conditions. The metal mining operations cover almost every known type of mining, including steam shovel mining operations. Sub-level and block caving, horizontal and incline cut-and-fill, top slicing and square set systems of mining predominate. The class of labor employed during the major portion of the period under discussion varied considerably. Mexican labor predominated at several branches, while at other properties the personnel was practically all American citizens.

In 1924, the year prior to the inauguration of the present plan of administering safety work, 2,829 disabling accidents occurred at the various coal and metal mining properties of the corporation, and the accident rate per thousand shifts worked was 1.111. In 1933, the disabling accidents totaled 13, and the accident rate per thousand shifts worked was .039, or a decrease of 96.5% in the accident rate as compared with the year 1924. The yearly decrease in the accident rate during the ten-year period, 1924-1933, was as follows:

#### ACCIDENT RECORD COAL AND METAL MINING OPERATIONS

Year	Disabling Accident Rate Per 1000 Shifts Worked	Fatal Accident Rate Per Million Man Hours	Disabling Accident Rate Per Million Man Hours
1924.....	1.111	1.23	137.66
1925.....	.718	.91	88.84
1926.....	.313	.64	38.43
1927.....	.175	.82	21.10
1928.....	.091	1.02	10.32
1929.....	.045	.44	5.18
1930.....	.047	.66	5.21
1931.....	.054	.60	6.10
1932.....	.064	.00	8.01
1933.....	.039	.74	4.08

The decrease in the various classes of accidents during the same ten-year period was as follows:

Classification	Number of Accidents		Accident Rate Per 1000 Shifts Worked		Decrease in Accident Rate
	1924	1933	1924	1933	
Slight Accidents ..... (14 or less days of disability)	2067	2	.812	.006	99.3%
Serious Accidents ..... (Over 14 days of disability)	737	9	.289	.027	90.7%

While the fatal accident rate has shown a substantial decrease during this same ten-year period, the increase has not been uniform from year to year. A total of 25 fatalities occurred in the year 1924, none in the year 1932, and two in the year 1933; the fatal accident rate decreased from .01 accidents per thousand shifts worked in 1924, to zero in 1932 and increased to .006 in the year 1933.

In the following tabulation, all disabling accidents which have occurred during the years 1925-1933, inclusive, have been segregated to the operation or hazard responsible for the accident. Under the heading of "Metal Mining Operations," all disabling accidents occurring in metal mining, milling, smelting and surface operations are included. "Coal Mining Operations" include both underground and surface disabling accidents.

safety hats as a protection against falling objects and materials, and a number of cases can be cited where a fatal or serious injury was avoided due to the protection afforded by this hat. The wearing of goggles is compulsory when performing certain work, both on the surface and underground, such as picking, sledging, collaring of holes, and in certain operations connected with shop work. The wire screen type of goggle is used in the underground department, and the glass lens type on surface operations. The use of safety toe shoes and bootees is insisted upon as a protection against falling object and material.

The use of safety hats, safety shoes and goggles was made compulsory in 1926-1927. The effectiveness of this safety equipment is evident in the following comparison of head, eye and foot injuries:

#### SEGREGATION OF DISABLING ACCIDENTS YEARS 1925-1933, INCLUSIVE

Classification	METAL Mining Operations		COAL Mining Operations	
	Percent of Disabling Accidents Including Fatalities	Percent of Fatal Accidents	Percent of Disabling Accidents Including Fatalities	Percent of Fatal Accidents
Fall of ground or coal.....	15.6	31.0	23.8	74.0
Handling ore, coal or waste....	12.9	8.5	21.2	
Handling material .....	9.2		6.0	
Underground haulage operations	9.1	7.0	23.8	17.4
Fall of persons .....	8.3	12.7	1.7	
Flying objects—including dust..	3.0		2.7	
Falling objects or material ....	5.6	1.4	5.8	
Burns .....	5.5	2.8		
Handling tools or equipment ...	5.0	1.4	6.7	
Undg. drilling and setting up...	3.0			
Surface and R. R. haulage .....	2.7	1.4	0.2	
Explosives and blasting .....	2.6	15.5		
Machinery .....	2.3	1.4	3.9	
Nails and splinters .....	2.2		0.1	
Steam shovels .....	1.3			
Shafts .....	0.8	1.4		
Electricity .....	0.7	4.2	0.9	4.3
Conveyor systems .....	0.7	5.6		
Mine or powder gas .....	0.5	5.6		
Cranes .....	0.2		0.1	4.3
Miscellaneous other causes ....	3.8		3.1	

Falls of ground have accounted for a large proportion of the fatal and serious accidents. The installation of flood lights in stopes, and the adoption of rigid light-weight bars have done much to insure a proper examination of the back, and the barring down of loose material by the workmen.

The graphic charts which accompany this discussion portray the progress which has been made in eliminating accidents in those operations and hazards responsible for the majority of the disabling accidents.

The use of protective wearing apparel has effected a very substantial reduction in the number of disabling accidents due to head, eye and foot injuries. All underground employees are required to wear

#### HEAD, EYE AND FOOT INJURIES YEARS 1924-1933, INCLUSIVE

Year	Eye Injuries	Head Injuries	Foot Injuries
1924.....	302	175	309
1925.....	182	102	214
1926.....	83	57	150
1927.....	22	22	70
1928.....	17	6	40
1929.....	13	4	16
1930.....	3	2	12
1931.....	6	1	6
1932.....	4	0	7
1933.....	0	1	0

(Concluded on page 70)



# Anthracite and Bituminous Coal

## Industry of Pennsylvania

### in 1933

By W. H. GLASGOW \*

**F**OR the first time in four years there appears a most encouraging sign of recovery in this industry. Since 1929 there has been a consistent falling off in production each year. This steady decline was not only stopped in 1933, but a slight improvement was made over 1932—the lowest depression year. Still, the production for 1933, which amounted to 49,507,577 net tons, is about 37 percent below normal.

How much of this loss is due to the effect of the depression and of moderate temperatures during the coal-burning months, on the one hand, and to the competitive fuels and imported foreign coal, on the other, is, of course, impossible to say; but there is sufficient evidence to permit the drawing of a reasonable conclusion.

For instance, during the first five months of 1933 anthracite production fell off more than 3,500,000 tons, as compared with the same period in 1932. During the remaining seven months of 1933, with the National Recovery program in operation, this 3,500,000-ton loss was completely overcome without any unusual assistance from the weather, as reports from the United States Weather Bureau show the number of degrees excess in temperature above normal during the seven coal-burning months of 1933 to be nearly 300. This would indicate that the anthracite industry should find itself in a fairly comfortable position as the Nation works itself out of the depression.

The anthracite industry depends largely upon the millions of home owners throughout the New England and Middle Atlantic States, and these people prefer anthracite and will use it when economic conditions permit.

The captains of this industry realize that anthracite has many advantages when compared with some of the competing fuels, but the advantages which

it lacks in the way of convenience for its millions of women firemen have not been lost sight of.

The Anthracite Institute, an organization composed of mine operators, has for several years devoted considerable time to the education of the users of this fuel in the correct method of firing. Much time has also been spent in the scientific development of automatic furnaces for anthracite use. Experimental plants of this kind have operated with complete satisfaction during the most severe weather. Automatic water heaters and improved kitchen stoves have also been developed and the industry anticipates liberal use of these improved anthracite burners.

#### BITUMINOUS IN 1933

The year opened with a gloomy and depressing outlook and continued without much improvement for the first half of the year. Mines were working less than half-time with less than one-half the regular number of men employed. Increased production per man, longer hours, and low earnings—in some cases less than \$2 per day, with the pieceworkers doing much work for nothing—was not uncommon, particularly at the smaller mine operations. The morale of both the workmen and operators in the mining industry was at its lowest ebb.

Coal was being sold as low as 50 cents per ton; slack as low as 5 cents per ton, and in many cases coal which had stood for months in railroad cars on sidings was given away for the freight and unloading. Many operators were forced to not only close their mines but lost their properties as a result of forced sale by their creditors.

The first signs of improvement came with the general improvement in business following the introduction of industrial codes under the National Recovery Act. The Bituminous Coal Code, with uniform wage scales and fixed minimum selling prices, eliminated, almost entirely, the severe competition previously existing in the matter of wages and selling price in the several competitive areas. Much tonnage was lost in Pennsylvania as a result of labor trouble or stoppage of work, particularly at the "captive mines" controlled by the steel industry.

Taken as a whole, the labor and operating conditions improved greatly under the new coal code and the loss of the first half of the year was not only made up but a gain of more than 4,000,000 tons in production was shown for the year, as compared with the year 1932. Undoubtedly both capital and labor have profited greatly by the elimination of unfair competition under the terms of the coal code and even better results will follow a more wholehearted compliance with the code and more rigid enforcement by the designated authorities.

The safety program of both the Federal and State Governments has suffered greatly, as might be expected, during the period of transition and the educational work, though thoroughly organized and smoothly operating, has been retarded, or stopped entirely, since the beginning of labor disturbances in the unorganized fields about the middle of the year.

There is, already, evidence that matters are adjusting themselves and, with better discipline in the mines and better cooperation between employer and employees, the old interest in safety can be revived. Notwithstanding the adverse conditions just referred to, we closed the year with the lowest number of fatalities, based on production, in the history of mining in this state. This record applies to both the anthracite and bituminous fields.

\* Secretary of Mines, Commonwealth of Pennsylvania.



# Form and Occurrence of Gold In Pyrite

By R. E. HEAD \*

**T**HIS paper is a progress report on the physical characteristics of gold in pyrite, as determined by microscopic study of certain gold-bearing pyritic ores. The study has been conducted to obtain information that would assist in solving problems pertaining to the extraction of gold from pyritic ores, particularly those of low grade. No special consideration has been given the geological occurrence or genesis of the ores studied, since the problem involved was of a metallurgical nature.

There exist large numbers of low-grade pyritic ores containing small amounts of gold which are being exploited at the present time. The gold has been extracted from some of these low-grade pyritic ores without any difficulty by the various common methods of treatment, namely, flotation, cyanidation, or amalgamation. Certain types of low-grade gold ores have been found from which the gold was not recovered satisfactorily by any one of these processes alone. Such ores have been termed refractory, and the development of methods suitable for their treatment presents an important metallurgical problem. The gold content of the tailings from the treatment of these refractory ores is often relatively high and in many instances represents an appreciable economic loss.

Flotation has been used to good advantage with the pyritic gold-bearing ores for concentrating the pyrite, and thereby frequently making the over-all recovery of the gold as high as 96 or 97 percent. However, this pyritic concentrate is often of unsatisfactory grade, or the location of the deposit is so remote that further treatment is desirable. It is often more profitable to concentrate highly or to convert the gold into bullion on the premises.

## EXAMPLES OF GOLD-BEARING PYRITIC ORES

The following examples are cited to give a general understanding of the nature of such ores and the difficulties that have been experienced in treating them:

*Example 1.* This ore is composed largely of pyrite associated with quartz. The pyrite is coarsely crystalline and is of the dense, hard variety. Hand samples indicated that the ore as a whole had been shattered to some extent, but

the faces of the pyrite crystals are highly reflective and showed no evidence of oxidation.

Specimens prepared for microscopic study were remarkable for the absence of pores and pits, which are so characteristic of some varieties of pyrite. Microscopic study of polished sections showed that numerous pyrite grains had been shattered and broken and that quartz had filled the cracks and fissures. No other minerals were present, and no gold was found by studying specimens in this manner.

The head sample of the ore assayed about 1.18 ounces of gold per ton, and the maximum recovery of the gold by cyanidation was 45 percent. In this particular case over 90 percent of the gold was recovered by flotation with a ratio of concentration of 5.4 to 1 and a concentrate containing 6.7 ounces per ton in gold. The concentrate was of a high grade; however, if it could be cyanided successfully a material increase in profit would result.

*Example 2.* The sulphide portion of this ore is chiefly pyrite, but a small quantity of arsenopyrite is also present. The pyrite contains most of the gold, although it is likely that the arsenopyrite may also be gold-bearing. The pyrite occurs in a quartzose gangue, with some carbonate, and is, like that described under example 1, of the crystalline variety. The crystals are relatively small and very dense and compact, as evidenced by the absence of pitting during polishing. Microscopic examination of polished surfaces failed to disclose the existence of any metallic gold. Careful concentration of minus 200-mesh material by panning and sedimentation resulted in finding several thin platy specks of gold.

The gold content of the average ore is approximately 0.2 ounce, and the ore body has been proved to be of large tonnage. Treatment of the ore by flotation resulted in a recovery of 92.5 percent of the gold in a pyritic concentrate assaying about 2 ounces. The ratio of concentration was approximately 11 to 1. The highest recovery that could be obtained by cyaniding the concentrates or

the crude ore was 60 percent. It has been stated that the recovery made by cyaniding was not improved by very fine grinding. Roasting the ore resulted in releasing the gold, and a recovery of approximately 90 percent was made by cyaniding the calcines.

*Example 3.* This material is the residue left after a concentrate made from a pyritic gold ore is cyanided. As part of the treatment by concentration and amalgamation, these cyanide tailings have been stored in a dump and contain approximately 0.2 ounce of gold per ton. The product is relatively coarse, some of it being plus 200-mesh and about 25 percent minus 200-mesh. Some oxidation of the pyrite has taken place, resulting in the presence of a considerable amount of limonite. Quartz is the chief nonsulphide mineral, and pyrite represents approximately 30 percent of the tailings.

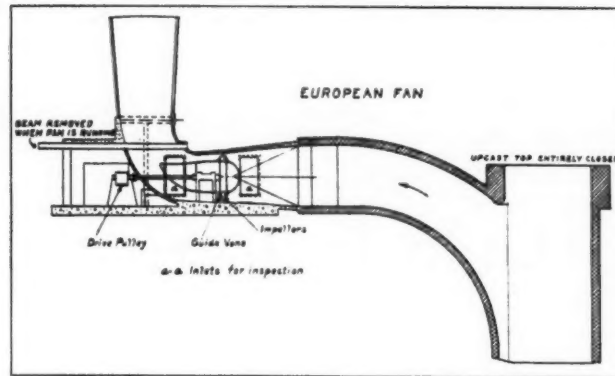
Microscopic examination of polished briquetted sulphides showed that pyrite was the predominating mineral and that minor quantities of pyrrhotite, galena, sphalerite and chalcopyrite also were present. No gold was found during the examination of polished-pyrite surfaces, but several small, platy specks of gold were identified in the residue resulting from the decomposition of the sulphides with acid. These particles were smaller than 200-mesh (0.074 mm).

Straight cyanidation of the dump material did not extract a satisfactory amount of the gold, and it was reported that "excessively fine grinding does not expose more than about 65 percent of it to the action of cyanide solutions." This particular ore presents difficulties which do not appear to exist in the other two ores examined, and high recovery of the gold by cyanidation seemed dependent upon some type of pretreatment, such as roasting. Roasting of this ore, followed by cyanidation of the calcines, developed further difficulties which were unforeseen, thus resulting in variable and erratic extraction of the gold.

These examples serve to illustrate variations in the nature of the problems that have been experienced in the treatment of low-grade pyritic gold ores and to emphasize the importance of determining more dependable facts relating to the form and occurrence of gold in pyrite. Furthermore, the increase in the price paid for newly mined gold has greatly stimulated the working of de-

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\* Microscopist, U. S. Bureau of Mines



# MINE FAN DESIGN

By J. F. MacWILLIAMS\*

IT IS very doubtful if many mine operators appreciate the importance of purchasing properly instead of paying properly. A cheaper fan is purchased but the power bill for the year would be enough greater to have purchased a good fan.

Many American built fans appear very crude and unfinished when compared with those built in Europe. Reading American written papers from time to time, it is certain that the importance of properly designed chimneys, curves instead of angles, elimination of obstructions, close clearance between wheel and casing, too high velocities, reduction of turbulence, all are known and appreciated. But as these important principles in design are so rarely carried out, the only conclusion that may be drawn is many fans are built as cheap rather than as good as possible.

The operator consequently pays the cost of the good fan many times over during its life. Many fan tests are but partly made as measurements are taken on one side of the fan only, few are taken on both the suction and discharge sides.

The drawings and curves give a comparison of the performance of European and American built fans. It will be easily noted the easement curves, elimination of obstructions perfectly designed chimney about 24 feet high, ball or roller bearings outside the airway and guide vanes behind the impellers.

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One drawing shows an American centrifugal fan rebuilt at a cost of \$1,000 which resulted in a saving of \$150 per month in the power bill. Another fan rebuilt along the same lines, increased the air from 80,000 to 100,000 cubic feet per minute with an increase in the horsepower necessary to drive from 100 to 125. No change in speed was made.

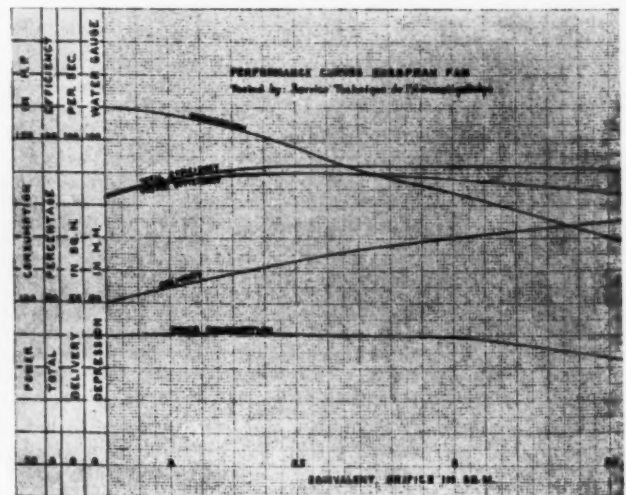
There are cases where it requires more horsepower to pass the air through the fan than through the mine. It is possible to greatly reduce the loss in the chimney and inlet of many fans but in the centrifugal fan there are two right angle turns the air must make, greatly increasing the friction through the fan and for this reason I believe the Aerex or Aerovane type of fan will eventually displace the centrifugal type.

For the operator with little capital to invest, it is in most cases possible to

effect considerable saving by rebuilding the present fan.

European engineers have recognized the careless manner in which most fan tests are made and have drawn up preliminary specifications as to the manner in which such tests shall be conducted. The preliminary specifications may be found in the *Colliery Guardian* of February 2, 1934, and Professor Henry Briggs deserves great credit for his part in producing same.

It is stated that complete costs of purchasing and installing the Aerex type of fan may be recovered in the reduced cost of power in from 12 to 18 months. You may draw your own conclusions.



# A Review of Coal Cutting Machines

By G. F. OSLER\*

**T**HE introduction of the chain cutting machine to take the place of hand mining was, in my opinion, one of the most important events in the history of the bituminous coal industry. The use of the chain cutting machine has been a large factor in speeding up production, and for this reason its introduction was fought by the miners as was its predecessor, the air punching machine. The puncher did mechanically what the miner did with the pick.

There are still persons identified with the coal industry who frown on the increased use of mechanical helps in coal production but seldom, if ever, have I heard any one expressing a desire to go back to the pick mining. The adoption of mechanical means of mining coal, whether by punchers, chain cutting machines or any other type of machine, has been the means of speeding up production which in turn developed new problems in transportation, shooting and safety.

The chain cutting machine of various types has been almost universally adopted by the bituminous coal industry as the means of mining coal, and of late years has been tried successfully in the production of anthracite. For a number of years there has been no radical departure from the basic principal of the chain cutting machine, viz, the cutting chain with removable bits. The development and improvement in this type of mining machine has had to meet the demands of the industry which required greater mobility, more stability and safeguards for safety as demanded by the several state mining departments. The cutting chains have been improved as to strength and bit positions to take care of various seams of coal. The shape of the bits have undergone changes to suit the structure of the coal.

The continuous cutting machine was one of the outstanding changes in design, and inaugurated the system of

drawing ribs and pillars by machine mining, thereby further reducing the pick coal percentages. Another improvement was the self moving cutting machine which eliminated the necessity of having the machine moved by an animal or locomotive. The traction reel for the cable, followed by the power driven reel, all make for speed in getting to the working places. The restrictions imposed by state mine inspectors in several states started work on the development of flame-proof mining machines. These machines, while safer than the open type, were soon followed by the entirely closed or permissible machine. This type is explosion proof only if properly serviced.

The demand by the coal consuming public for large lumps forced the development of a shearing machine. This at first was simply an old type breast machine arranged to make a vertical cut. This was followed by a machine which could shear as well as make horizontal cuts. These horizontal cuts could be made only at some point above the track. The later type allow a cut to be made on the bottom. A coal saw has been developed which cuts vertical and horizontal kerfs, and the coal so opened up to be broken out by the use of hydraulic jacks. Hydraulic jacks had been experimented with some time ago in connection with a breast type cutting machine. All these machines capable of making vertical and horizontal cuts are track machines, and the width of the working face is limited to the length of the cutter bar; the length of the cutter bar is limited by the depth that the coal can be properly shot. The improvements and change in design of cutting machines and changing conditions in the mining industry are considerably like a

merry-go-round: a change in one means a change in the other.

The manufacturers of mining machines are dependent on the uses of their products for suggestions and criticisms which will help them in making improvements on present machines and the design of new ones. The cost of the cutting machines, both breast and short wall, is about three times that of the machines 20 years ago. The track machines cost about two and one-half times that of the present short wall machine. The present cost of any type of cutting machine makes it necessary for the mine management to get the most work possible from every machine.

The coal industry as a whole is now working under conditions changed considerably from those of the past six years, and there is no doubt there will be requirements put up to the manufacturers to assist in reduction of production costs. As the agreement now in force between the employees and operators provides for lower rates for cutting and loading where the coal is drilled and sheared, there should be an increased use of shearing machines. The trend of cutting practice seems to lean toward longer cutter bars, both on short wall and track machines as considerable cutting is done by the day.

It is difficult to guess what the next refinement in cutting machines will be, or whether some other type machine will supplant the chain cutting machine. On account of the generally prevailing surplus of small sizes, some method of breaking the coal out of the face so as to produce a smaller percentage of fine coal (bug-dust) would be looked on with favor by mine operators. There are cutting problems of varying natures in the different fields, and the operating officials try to overcome the natural disadvantages that confront them. In my mind, the track mounted machine built to cut in any position has given the operator a machine with wonderful possibilities and only its cost keeps it from being more generally used.

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# BACK TO THE FACE

By H. H. TAYLOR, JR.\*



**I**MPROVEMENTS in methods of consuming coal during the past decade have made for better combustion equipment and better-trained men, not only in large power plants, but in many of the smaller consuming units. This has had a tendency to make the average coal buyer more particular than ever in selecting his fuel. Competition for markets has necessarily become keener among coal producers and at the present writing it appears that "price" selling has seen its best days. It is, therefore, inevitable that a renewed drive on the part of coal producers for better preparation is imminent.

## DEFINITION AND ELEMENTS OF PREPARATION

Preparation might be defined as that series of operations which transforms raw coal in place to a salable product ready for shipment. It involves sizing and cleaning in various degrees, depending upon the economics governing each individual operation.

Preparation begins at the face. Its scope here may be limited by the thickness and pitch of the seam, by the character of top and bottom, by the character of the coal itself, by the occurrence of extraneous impurities and by the width of the face being worked, which, in turn, depends upon roof conditions and the mining method selected. For instance, a mine with very friable roof might be confined to narrow working places and, in the case of thick seams, the working height might be limited by the necessity of leaving a top coal bench. The man in charge of winning the coal from this face must take conditions as they are provided for him by nature and the engineer developing the property. From this point on it is his task to supervise the cutting and drilling, and to provide the most satisfactory method of breaking down the coal preparatory to loading.

The production man's job, after breaking down the coal in the best possible

manner, involves loading it as economically as possible, cleaning it with reasonable diligence at the face, and seeing that it is placed in a mine car or other conveyance for the haulage crew. The haulage item has an important bearing in the ultimate condition of the coal in that the conveyance must be easy to load, must handle the product as gently as possible to prevent excess breakage and must deliver it to the finishing plant in good condition. Many a dollar has been lost by improper handling during transportation.

At the delivery point the tipple foreman takes the responsibility of seeing that the coal is properly sized and treated with a final cleaning before loading in cars. He also is limited by the facilities that are provided for him by the engineer who designed the plant, but from the time the mine run product is turned over to him until he has it loaded in the railroad car for shipment he is responsible for an important part of the preparation, including screening, hand-picking or mechanical cleaning, inspection and proper mixing and loading.

## HISTORY OF PREPARATION

Probably the earliest attempts at mining coal to fill consumer demand involved picking coal from the solid face by hand and dumping same into railroad cars or other conveyances, without any attention being given to changing the state of the raw coal.

The next development, of course, was to use explosives to break the coal from the solid face and thus save considerable labor. Doubtless the market demanded

something better than raw coal, as occurring in the seam, and the practice of picking out the largest pieces of free rock at the loading point came into being and was undoubtedly followed by the practice of picking the impurities out at the face. It seems logical that some forerunner of the present docking system was then inaugurated, particularly if the operator was hiring any number of men and establishing certain rates in pay and working conditions with them.

Soon the consumer became conscious of the advantage of sized or screened coal and thus forced the operator to start the practice of screening the coal into one or more sizes and hand-picking the free rock from these sizes to a greater degree than had heretofore been exercised.

At about this point the mine operator must have become "size conscious" and begun to see the advantage of controlling his size percentage by more attention to the operation of breaking coal from the solid face. Thus developed the practice of snubbing; first by hand and later by mechanical devices, such as punching machines, and ultimately by various types of electric undercutting machines.

Here entered the safety factor which made itself felt through the ignition of mine gases by some of the explosives used. Permissible powder came into being and the operator soon found that, although he was more successful in combatting the evils of fire and explosion, he was set back several years in the manner of control over his sizes produced at the mining face.

More exacting consumer demand dictated a greater variety of sizes and standards of cleanliness which gave birth to some of the modern high-speed screening devices and fine dust eliminators of which the most modern washing and dedusting plants seem to be the latest development.

## IMPORTANCE OF FACE PREPARATION

A good many thousands of dollars and a good many valuable days have been spent on improvements in the various phases of coal preparation during past

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years. It is becoming more and more evident, however, that the finest equipment and the most expensive finishing plants are unable to perform up to the expected standards if the coal fed to them by the production man at the face is improperly mined, is shattered beyond the point of stability or is contaminated with excess impurity. Needless loading, handling and disposition of free impurities is bad enough, but can be controlled by adequate facilities at the finishing plant. Pulverized, or badly shattered coal, however, presents an irreparable loss.

In all these steps through the years a very definite cycle seems to have operated, governed by the elements of cost, safety standards and market demand. With each new market demand a new economic problem was created in the finishing plant to meet this demand. This immediately shifted part of the load to the production man underground and ultimately wound up at the coal face. There is a definitely increasing trend toward control of size percentages by strict face supervision and by the application of novel methods of drilling and breaking the coal.

#### RECENT DEVELOPMENTS AT THE FACE

Electric cutting machines, capable of making horizontal cuts in any position from the bottom of the seam to the top, are on the market today. Some of these types of machines are also equipped to make vertical or shearing cuts within the range of ten or twelve feet on either side of the room center.

In most cases these machines work from a track mounting, which necessarily produces an arc cut. The advantage of this type of machine from a cost-and-capacity standpoint has been proven. Some of the disadvantages of breaking down the coal from this arc cut, as against the more or less standard rectangular cut which has been in vogue since the early days of electric undercutting machines, have presented interesting drilling problems.

In certain cases power drills have been mounted on the cutting machine and holes have been drilled into the face from one position, while the machine was in place for cutting. Certain disadvantages, occurring as a result of this type of drilling, have caused further development, whereby the drill is mounted on a movable arm, so as to offer a number of different drilling positions from the same machine position. With the attacking and overcoming of most of the drilling problems has arisen the further problem of the proper spacing of holes and use of a medium in breaking down the coal. In the past this medium has almost invariably been a high-speed explosive, so it is quite natural that the manufacturers of such explosives have been active in revamping their product to suit the changing needs of the coal producer.

Because more machinery is being used to load and transport the coal and because the shattering effect of high-speed explosives on the coal shot down has been accentuated by the breakage attendant with mechanized loading, a good deal of thought has recently been exercised toward mediums for breaking down the coal other than explosives.

Several years ago a mining company in the middle west developed a tube, or shell, for use in connection with high-speed explosives on the theory that the

force of the expansion produced by the gases from the explosives could be better directed toward the work to be done, that less explosive material could be used per ton of coal removed and that the shattering effect upon the coal dislodged could be minimized.

In another section the same idea, involving the use of a shell or cartridge, was developed to attempt to produce the same beneficial results without the use of explosives containing dynamite bases. Any action breaking the coal away from the solid face necessarily involves expansive force and in the case of dynamite base explosives this force is produced by chemical action. In the method referred to immediately above the combination of chemical reaction and change of the physical state of the gas (carbon dioxide) is used.

Probably the most recent development along this line involves the use of a bottle or cartridge in which an expansive force is built up entirely by physical means and released at a predetermined pressure with the use of common air as the agent.

It is likely that development along this line will proceed rapidly within the next few years, as results to date seem to indicate that the desired effect on the coal is obtainable at a cost comparable to any method yet developed. The general tendency seems to be to slow down the speed of the action on the coal and thereby more definitely control the size of the product to be produced. Any development along this line will be greatly affected by the necessity for keeping within the bounds of good safety practice and the success of any of these new methods will depend upon their safety in operation, as well as the cost experienced and the results produced.

In conclusion, it seems that there is a very definite interest among mining men in improved preparation. This interest is centering itself upon production activities at the face. Surely some revolutionary changes in face equipment, the mediums employed to remove coal from its natural state and the development of skilled practice in the operation will be seen during the coming year.

## Progress in Safety in Coal Mining in the United States

(Continued from page 35)

to a large extent dependent upon the public in one manner or other for support for several years after an accident and possibly as long as they live.

Unquestionably, the coal-mining industry should operate under safety and health requirements at least as comprehensive as those listed below, if our coal mines and our coal miners are to work under anything like the safe conditions they ought to have and can be given:

(a) Every mine should maintain an actively functioning safety organization.

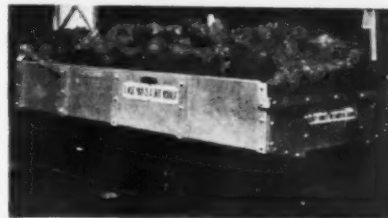
(b) All foremen, safety inspectors, shot-firers and bosses in charge of underground workers should have certificates of competency, preferably issued by the state, upon passing a rigid examination.

(c) Every mine should be given a rigid safety examination within two hours before the working shift is allowed to enter.

(d) Every mine should maintain at least two travelable means of escape.

(e) Every person working underground should be checked into and out of the mine.

(f) All accidents should be reported to an appropriate Government agency, with at least a carbon copy of every such report to the U. S. Bureau of Mines.



Mine Car Carrying Safety Reminders

(g) Every person working in or about a mine should have first-aid training.

(h) All mines should establish and keep in effect a systematic method of timbering, defining the minimum spacing of supports and allowing for additional supports where there is necessity for them.

(i) All working places in mines should be visited at least twice during the working shift by a competent supervising official, who should see that the workers are taking necessary safety precautions.

(j) All underground blasting should be by permissible explosives while the working shift is out of the mine.

(k) All mines should be ventilated adequately by mechanical equipment, with the main fan preferably located on the surface, out of direct line of the air course leading to it. The oxygen content of working places should be maintained above 19 percent, methane below 1½ percent, and CO, below 1 percent; poisonous gases, such as CO, H<sub>2</sub>S, or others, should be removed by air currents or so diluted that they are harmless.

(l) All mines which are not wet should be kept adequately rock-dusted, except that the face region should be kept sprinkled for at least 40 feet from the face, and machine cuttings should be wet as the cutting is done.

(m) The open electrical equipment now used in bituminous coal mines should gradually be replaced by permissible equipment.

(n) All bare power lines in mines should be adequately safeguarded throughout their length against contact by persons.

(o) No open flame lights should be allowed underground.

(p) No internal-combustion engine should be used underground.

(q) Adequate clearance should be provided on all underground haulage roads for the protection of persons who must travel or work in those places.

(r) Openings to abandoned mines or parts of mines should be adequately sealed or protected against the entrance of persons or animals.

# TRENDS

## in

# CONVEYOR MINING

By JEROME McCRYSTLE\*

**P**ROBABLY every mining company has had to consider the matter of mining economies under restricted production. The obtaining of economies via the so-called "large divisor" route appears at this time to be indefinitely deferred. In this situation an increasing number of operators are turning to the conveyor as a dependable means of curtailing unit costs. Face mining and transportation number among the largest single items of production costs and in attacking these the conveyor has been found a distinct asset. The problem of curtailing these costs is common to both anthracite and bituminous fields.

The past few years have shown a marked increase in the number of underground conveyors and conveyor produced coal in the anthracite, and there are indications that renewed activities in the bituminous field will witness a corresponding trend toward conveyor mining. Some idea of the status of conveyor mining in the anthracite may be had from the increase in the number of shaking conveyors alone, which, during the past twelve months increased 33 1-3 percent over the number then in operation. The total number of shaking conveyors in use as of April 1 approximates 1,200 of the accentuated motion type. In addition to these there are an undetermined number, about 200, of the cam type, air, and other improvised units employing a shaking reciprocal motion. Chain-flight conveyors and belt conveyors are being installed in increasing numbers.

In the anthracite there are now a considerable number of so-called 100 percent mechanical mines where all but a very small part of the output is of conveyor origin. Mines 70 percent conveyorized are no longer uncommon. There are quite a number of mines delivering over 2,000 tons daily of conveyor coal. This in the anthracite is a decided departure from the set routine of a decade back.

While the shaking conveyor, chain conveyor and belt conveyor each offer spe-

cial advantages over the other, under peculiar conditions, in practice, so far, they are found operating under identical conditions. Their application is, however, gradually falling into three broad groups; viz., the shaking conveyor for light and flat pitches and where the alignment of the pillars is bad; the chain conveyor for heavier pitches and severe adverse pitches; the belt conveyor for long range and trunk conveyor work on pitches not too severe. A number of installations combine the three types of conveyor; the belt conveyor for development and trunk gathering; the chain conveyor for down-grade mining, discharging into the belt; and the shaking conveyor for up-hill mining, also discharging into the belt conveyor. The belt conveyor discharges into the mine car and when reversed takes the supplies and timber to the other conveyors.

Maximum economies are not yet being realized from conveyor installations. They have been purchased so rapidly that developing the crews and obtaining the initial major economy has been all that has been attempted. They have been installed in locations whose primary purpose was conventional hand mining. Experience, however, is gradually developing a new technique and the workings in many cases are being laid out to achieve a full measure of the economies that the conveyor has made possible.

The conveyor is being used and has been found profitable under such conditions as follows: Thin beds; in pillar recovery, particularly where the gob is heavy; in flushed areas; in pitches too heavy for the mine car; in recovering pillars too narrow to mine with the car following; where the roof is tender and the mine car would entail double timbering; in increasing the production from limited areas; in rock hole work, when one haulage road can be made to serve for

the extraction of two beds; in reducing both the extent and cost per yard for development by using mother conveyors and mining to the rise and to the dip off the one road; in reducing the cost of and simplifying face transportation.

Progress in the development of equipment during the past year has consisted as a whole of a general perfecting and strengthening of existing equipment. No distinct departures in design have been placed on the market in recent months. It can be said, however, that a great deal of study and experimentation has been devoted to increasing the elevating abilities of the shaking conveyor, with results that promise to measurably increase the value of the shaking conveyor as an all-purpose machine in its special field.

Improvements in the shaker drive proper embrace the use of alloy steel for all parts under severe stress. The universal substitution of the steel case for the cast iron and semi-steel case. Construction that permits any drive to be used either as a side drive, singles or double arm, or as an underneath drive, single or double arm. Motor mountings are employed that hang the motor on the drive case and thereby avoid any possibility of distortion in the bed plate affecting the mechanical operation of the drive. The overall height of the case has been reduced to a point where the motor governs the height required for installation.

Drive chutes have been generally strengthened and reinforced and made interchangeable for side or underneath operation. The steel that enters into the conveyor trough has been a matter of considerable research. Manufacturers are coming to definite conclusions as to carbon content and the use of other elements to prevent bending and buckling. Results of a special trough annealing process tend to show a 100 percent greater resistance than identical troughs not so annealed. A number of ingenious trough connections have been developed that expedite the work of assembling or dismantling installations. Several new types of trough carriers are being offered; these are all of the anti-friction type and offer convenience in handling and silence in operation.

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It is, however, in the shaking qualities—the deceleration and acceleration—that the manufacturer has shown greatest improvement. One school controls the speed of advance and reverse stroke and method of reversal, electrically. Another adapts the gear train and number of strokes to meet any predetermined condition. Operation of shaking conveyors on long adverse grades up to 10 percent has been proven practical, while grades up to 20 percent for short distances have been successfully negotiated.

Among accessories for shaking conveyor operation may be noted car pullers that operate from the shaker drive or from the trough motion; swivels that operate on angles as great as 90 degrees. Bell cranks, especially designed for shaking conveyor work underground are coming back into favor in meeting certain requirements. Combination pulling and lifting jacks facilitate the work of installing and moving equipment. Double and triple "V" troughs that permit double and triple loading points, are being used for intensive loading at the working face, where no great amount of timbering is required. Face loading is thus put on an intensive basis by the plan as just above listed, or by using bell-cranks, or right-angle swivels, or by short independently operated face conveyors.

Among chain conveyors can be mentioned small, compact, easily portable units for handling the discharge from shaking conveyors. Drives, except for very short conveyors, are located at discharge end and pivotally connected so that the conveyor can be regulated to fit the pitch and the drive can be located to accommodate the floor without impairing the mechanical operation of the completed unit. Chutes are made in optional lengths to suit purchaser.

The use of belt conveyors for face operation during the past few years has brought about a number of changes in design to meet underground requirements. Flat, or trough type, idlers are optional; the return belt has been enclosed; slippage on the drive pulleys has been greatly overcome, especially when belt travels in reverse. Construction of the side sheets and flexibility between sections and closing of the gaps in side sheets, installation without the use of bolts and wrenches, drives interchangeably right or left, and a number of other improvements are found in recent design.

The electric rotary drill is being used in increasing numbers as an adjunct to conveyor mining. There is a considerable difference of opinion as to a proper control and starting equipment and protective devices for electrically operated drills and conveyors. The wide variations in voltage in mine work, unskilled labor operating electrical equipment, and the necessity for a non-electrical remote control, and withal inexpensively, will probably require, eventually, starters especially designed for this work.

Development in solid coal is now being laid out to obtain greater economies from conveyor equipment. The amount of rock gangways and rock entries required under this plan is greatly reduced, because of the wide range permitted by the conveyor. Local dips and rises can be conveniently negotiated from existing development by merely selecting the proper conveyor. The po-

tential economic field of the conveyor is rapidly expanding and new applications are constantly being undertaken. There seems little question that the manufacturer will have the design of equipment keep pace with mining requirements and new applications as they arise.

## Form and Occurrence of Gold in Pyrite

(Continued from page 57)

posits and the treatment of dumps which were of doubtful value on a basis of gold at \$20.67 per ounce. Many such properties contain gold associated with pyrite and difficulties similar to those noted may be encountered in treating them.

### FORM OF GOLD IN PYRITE

Various theories have been advanced concerning the form in which gold exists in pyrite, and the idea that gold occurred chemically combined with pyrite has been considered. Chief among the arguments that gold occurs in pyrite in the metallic form is the experience of those operators who, by continued experimentation, learned that quite often finer grinding of the pyrite resulted in increasing the percentage of gold extracted by cyanidation. Exceptions to such practices are on record, and in certain instances it has been reported that the amount of gold extractable by straight cyanidation could not be increased beyond a definite point by grinding "excessively fine."

Metallic gold has been found and conclusively identified in every sample of gold-bearing pyritic ore that has been examined during the present study. The particles found were uniformly small and in few instances exceeded 0.074 mm (200-mesh) in diameter. The majority of gold particles in the pyritic ores examined were much smaller than 0.074 mm, and specks 5 microns in diameter (approximately equivalent to theoretical 2,200-mesh) have been observed on crystallographic faces of pyrite. (The determinations were confirmed by use of acids.)

Gold occurring in particles of micron diameters may be regarded as minute leaves or flakes that have formed on crystallographic planes and might be analogous to the occurrence of sodium chloride on the crystal faces of galena from the Joplin (Mo.) district. That gold occurs in particles of such extremely minute size should not be considered an unusual or extraordinary fact. In the extensive studies made at this station in the field of ore-dressing microscopy, numerous occurrences of sulphide inclusions 1 to 15 or more microns in diameter have been noted in polished specimens of complex ores of lead, zinc, copper, and silver.

Outstanding common examples of minute inclusions in sulphides are chalcopryrite in sphalerite, galena in sphalerite, chalcopryrite in pyrrhotite, and chalcopryrite in pyrite. The fineness of size to which metallic gold may be subdivided is such as to make the metal a favorite with those working in the field of colloidal chemistry; for example, see Freundlich's Colloid and Capillary Chemistry.

The occurrences of gold in pyrite are not regarded as analogous to the inclusions found in complex sulphide minerals. Emphasis is placed on the fact that all gold found in the low-grade pyritic ores examined has been deposited on crystallographic planes, but the occurrences of intimately associated sulphides as inclusions are predominantly the result of replacement or of "unmixing" and segregation of an exceedingly complex mixture of sulphide minerals. The occurrence of minute specks of chalcopryrite commonly found in sphalerite may be cited as an exception to the preceding statement, since chalcopryrite is often seen in sphalerite as minute specks or slender veinlets arranged in parallel rows; in many instances such occurrences have been interpreted as an indication of the deposition of chalcopryrite along crystallographic planes in the sphalerite.

## The Effects of 64.64c Silver on the Value of Copper Ores

(Continued from page 51)

and average silver yield seems to indicate that selective mining of the higher silver ores in a given mine to increase silver production without adding to the copper surplus would not be feasible.

In 1928 the districts which produced 82 percent of the silver derived from copper ores produced less than half the copper. In the last analysis the deciding factor as to which districts will survive will be the net cost of producing copper; in determining this, the precious metal content of the ore is only one of many factors. Some of our lowest cost producers operate on low-grade ores in which the silver and gold content is relatively small. The new silver price, therefore, is not to be expected to cause much change in the sources of copper production in the United States—or greatly to increase the production of by-product silver from copper ores.

In conclusion, it may be said that the role of 64.64-cent silver in the future of the United States copper industry will be very small indeed compared with such factors as the future trend of the price of copper, the future copper-tariff policy of the United States, and the future developments in copper technology.

## Wheels of Government

(Continued from page 36)

want to keep the present Congress here all summer and it doesn't consider the Wagner-Lewis bill pressing enough to warrant prolonging the session more than it will be prolonged (probably to June 15). However, the House Ways and Means Committee will probably report the bill out shortly and Senator Wagner will go ahead with hearings on the measure. But it would necessarily be around the first of June before the bill could get out of committee in the Senate, which would be much too late for action this session. The bill doubtless will be one of the first to be acted on next session.



# PERSONALS



D. D. MUIR, Jr.

D. D. MUIR, JR., has been promoted and goes to Boston May 1 as vice president in charge of western operation of the United States Smelting, Refining and Mining Company. Mr. Muir has been located in Utah for many years as general manager of the company's properties in that State. He is president of the Salt Lake City Chamber of Commerce, governor of the Utah Chapter of the American Mining Congress and a member of leading clubs and organizations. Mr. E. A. HAMILTON, at present manager of the mines for the company has been promoted to the position left vacant by Mr. Muir.

CARROLL HUNTRESS has left the National Coal Association, of which organization he was secretary, to become president of Appalachian Coals, Inc. He succeeds J. D. Francis.

B. BRITTON GOTTSBERGER passed through Washington early in April enroute to Florida for a short vacation.

L. A. PALMER has been elected chairman of the hydraulic committee of the newly created Gold Mining Association of America.

DR. HERNY MACE PAYNE was in Los Angeles in April. He reports excellent progress at his gold property at Taos, New Mexico.

HOWARD I. YOUNG, president, American Zinc, Lead and Smelting Company, and president, The American Mining Congress, was in Washington April 17, where he made an address before the National Manufacturers Association.

J. G. PUTERBAUGH, president, the McAlester Fuel Company, represented his district in the recent conference on the coal code.

L. S. CATES has been in Arizona.

D. C. JACKLING recently visited the various districts in which his companies are producers.

ROBERT E. TALLY, president, United Verde Copper Company, has been appointed chairman of the Arizona Commission to the Century of Progress, and is in charge of Arizona's exhibit at the Fair this year.

J. V. N. DORR has been in Europe for several weeks, where he attended the International Congress of Pure and Applied Chemistry, held at Madrid, Spain.

TASKER L. ODDIE, well known as Senator and mine operator from the State of Nevada, has been elected president of the Gold Mining Association of America.

F. C. VAN DEINSE, Yuba Consolidated Gold Fields, has been elected president of the California Metal and Mineral Producers Association.

HARRY O. KING, since early in July, 1933, a Deputy Administrator in Division II, has been named to succeed Arthur D. Whiteside as Division Administrator of Division IV in charge of codes for finance, the textile industries and the wholesale and retail trades.

MYRON TAYLOR, chairman of the board, United States Steel Corporation, is in Europe.

OTTO HERRES, United States Fuel Company, has been elected president of the Utah Coal Operators Association.

CHARLES HAYDEN has returned from a three months' vacation trip to Africa, where he inspected the mines in the Johannesburg district.

WALTER B. CONGDON, Duluth, Minn., was severely injured by a recent fall and has been confined to a hospital.

DEAN F. A. THOMPSON, Montana School of Mines has been appointed to the mineral division of the northwest planning board of NRA.

P. D. WILSON was recently elected vice president, Pardner Mines Corporation.

WAYNE P. ELLIS, deputy commissioner, NRA, assigned to the coal industry, has resigned his position.

HARRY D. HUNT, mill superintendent for the Miami Copper Company since 1926, has resigned from that company to join the staff of the Newmont Mining Corporation, and will be located at Empire, near Jellicoe, 150 miles north of Port Arthur, Ontario.

D. D. MOFFATT, vice president and general manager, Utah Copper Company, Salt Lake City, Utah, was a recent visitor to New York.

ROSS D. LEISK, assistant general manager, United Verde Extension Mining Company, Jerome, Ariz., has been elected second vice president and a director of that company, vice H. S. Munroe. ARTHUR NOTMAN has been reelected to the directorate to fill the vacancy made by his resignation during the year to take a position with the Federal Government.

WM. B. DALY, general manager of mines of the Anaconda Copper Mining Company, Butte, Mont., has been a recent Washington visitor.

E. J. NEWBAKER, vice president in charge of operations of the Berwind-White Coal Mining Company, was in Washington during the month.

DR. L. C. GRATON, of Cambridge, Mass., was in Washington to attend the special tax conference recently held at the offices of the Mining Congress.

W. H. PETERS, of the M. A. Hanna Company, was present at the tax conference of the American Mining Congress on March 12.

EMIL RICHTER, treasurer and assistant secretary of the Howe Sound Company, was a visitor at the offices of the Mining Congress during March.

J. S. CULLINAN, of Houston, Tex., was a Washington visitor during the month.

REAMY JOYCE, of the Wood Preserving Corporation, was in Washington during March.



## Bituminous

Harvey Cartwright, of the Indiana Coal Producers' Association, spoke in support of the \$4.60 basic wage rate for the Western Kentucky district. He said Indiana operators were willing to pay

Bitter opposition to any wage differential for the bituminous coal mine operators especially in Western Kentucky and charges of illegal oppression of labor by one of the operators there were voiced by leaders of the United Mine Workers. Nearly a dozen district presidents from Kentucky and neighboring bituminous States followed each other to the microphone and told of the distressing conditions in western Kentucky and insisted

—Washington Star

Seven hours of labor shall constitute a day's work and this means seven hours work at the usual working places for all classes of labor, exclusive of the lunch period, whether they be paid on the day or the tonnage or other piece-work basis; except in cases of accident which temporarily necessitate longer hours for those

Under a recent order, all employers are required to post in conspicuous

# SCHEDULE A

	Minimum inside (Skilled Labor)		Minimum outside (Common Labor)	
	Per day	Per hour	Per day	Per hour
District A:				
Pennsylvania and Ohio.....	\$5.00	\$0.71 4/10	\$4.00	\$0.57 1/10
Lower Peninsula of Michigan.....	5.00	.71 4/10	4.00	.57 1/10
Panhandle District of W. Va.*.....	5.00	.71 4/10	4.00	.57 1/10
District B:				
Northern West Virginia†.....	5.00	.71 4/10	4.00	.57 1/10
District C:				
Southern West Virginia‡.....	4.60	.65 7/10	3.60	.51 4/10
Eastern Kentucky.....	4.60	.65 7/10	3.60	.51 4/10
Upper Potomac District of W. Va.....	4.60	.65 7/10	3.60	.51 4/10
Maryland.....	4.60	.65 7/10	3.60	.51 4/10
Virginia.....	4.60	.65 7/10	3.60	.51 4/10
Northern Tennessee.....	4.60	.65 7/10	3.60	.51 4/10
District D:				
Indiana.....	4.57 1/2	.65 5/10	4.20	.60
District E:				
Illinois.....	5.00	.71 4/10	4.00	.57 1/10
District F:				
Iowa.....	4.70	.67 1/10	4.00	.57 1/10
Wayne and Appanoose Counties, Iowa.....	4.56	.65 1/10	4.00	.57 1/10
District G:				
Missouri, Kansas, Arkansas, Oklahoma.....	4.60	.65 7/10	4.00	.57 1/10
District H:				
Western Kentucky.....	4.60	.65 7/10	3.75	.53 6/10
District J:				
Alabama.....	4.60	.65 7/10	3.60	.51 4/10
Georgia.....	4.60	.65 7/10	3.60	.51 4/10
Southern Tennessee, Hamilton and Rhea Counties.....	4.60	.65 7/10	3.60	.51 4/10
District J-1:				
Marion, Grundy, Sequatchie, White, Van Buren, Warren, and Bledsoe Counties in the State of Tennessee.....	4.60	.65 7/10	3.60	.51 4/10
District K:				
New Mexico.....	5.10	.72 8/10	4.10 8/10	.58 6/10
Southern Colorado.....	5.10	.72 8/10	4.10 8/10	.58 6/10
District L:				
Northern Colorado.....	5.25	.75	4.25	.60 7/10
District M:				
Utah.....	5.44	.77 7/10	4.48	.64
District N:				
Southern Wyoming.....	5.42	.77 5/10	4.44	.63 5/10
Northern Wyoming.....	5.42	.77 5/10	4.54	.64 9/10
District O:				
Montana.....	5.63	.80 5/10	4.82	.68 9/10
District P:				
Washington.....	5.40	.77 1/10	4.00	.57 1/10
District Q:				
North Dakota.....	4.50	.64 3/10	3.70	.52 9/10
		Tippie Employees		
North Dakota (strip mining, pit labor).....	4.50	.64 3/10	3.70	.52 9/10
South Dakota.....	4.50	.64 3/10	3.70	.52 9/10

Note: Differences between districts in the foregoing minimum rates are not to be considered as fixing permanent wage differentials or establishing precedents for future wage scales.

\* Includes Hancock, Brooke, Ohio and Marshall Counties.  
† Includes Monogalia, Marion, Harrison, Taylor, Lewis, Barbour, Gilmer, Upshur, Randolph, Braxton, Preston, and Webster Counties, and those mines in Nicholas County served by the B. & O. R. R.  
‡ Includes all mines in counties in W. Va. not named under District A and B in the Upper Potomac District.

places throughout their plants or buildings official NRA placards quoting the labor provisions of the Code applicable to the establishment. The posters are distributed through Code Authorities and application should be made to the Code Authority for the industry or trade of which the employer is a member, or to the State NRA Compliance Director.

The time for those who have not received the application forms is now extended until May 15, under an order, issued by Colonel G. A. Lynch, Administrative Officer, and reading as follows:

*April 14, 1934.*  
*Extension of Time to Apply for Official Copies of Labor Provisions*

It has come to the attention of this office that, although code authorities have made general distribution of application forms for official copies of labor provisions of NRA codes, many em-

ployers have not yet received them. Accordingly, in order to give ample time for the distribution of application forms, employers may have until May 15 to apply for their official copies. Any employer who has not yet received an application form should request one from his code authority or the State NRA Compliance Director.

By direction of the Administrator:  
G. A. Lynch, Administrative Officer.

THE TOTAL production of bituminous coal as estimated by the U. S. Bureau of Mines, Washington, D. C., for the week ending April 7, amounted to 5,450,000 net tons. Compared with production of preceding week, this is a decrease of 3,755,000 tons, or 40.79 percent. Production during the corresponding week in 1933 amounted to 4,755,000 tons.

The total production of soft coal during the current calendar year to April 7, is estimated at 108,833,000 net tons, as compared with 83,080,000 tons during the corresponding period in the preceding year, showing an increase of 25,753,000 tons.

## Anthracite

THE TOTAL production of anthracite (which includes colliery fuel) for the week ending April 7, as estimated by the United States Bureau of Mines, amounted to 824,000 net tons. This is a decrease, as compared with production of the preceding week, of 202,000 net tons, or 19.69 percent. Production during the corresponding week of 1933 amounted to 874,000 tons.

TWO CASES respecting a tariff duty on anthracite coal, involving questions growing out of "most-favored-nation" treaties between the United States and Germany and the United States and Great Britain, were decided by the United States Court of Customs and Patent Appeals in an opinion just handed down.

The cases were consolidated for hearing, the Government being appellant and Domestic Fuel Corporation and Geo. E. Warren Corporation being the respective appellees. The Appellate Court affirms the judgment of the United States Customs Court holding coal imported in 1932 from the countries named entitled to entry duty-free.

Coal is on the free list under the Tariff Act of 1930, but the Revenue Act of 1932, which dealt, in the main, with internal taxes, provided, in section 601 thereof, tariff duties upon a number of articles, such as oil, lumber, copper, and coal, "unless treaty provisions of the United States otherwise provide." Paragraph 3 of said section which is the coal paragraph, provides that a duty of 10 cents per hundred pounds shall be levied upon coal, but further provides that same shall not be imposed if, during the preceding calendar year, the balance of trade in coal between the United States and the country from which the importation is made is favorable to the United States.

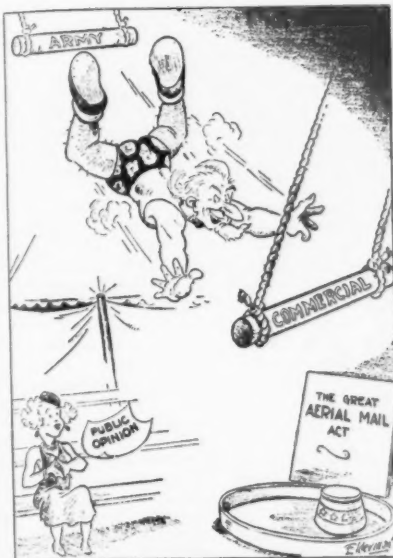
Coal imported from Canada and Mexico in 1932 was held by the Treasury Department to be entitled to free entry, the balance of trade with those countries, in coal, being favorable to the United States during the year 1931.

The Ambassadors from Germany and Great Britain respectively made representations to the State Department of the United States, claiming, in effect, that by reason of the "most-favored-nation" treaties existing between their respective countries and the United States, coal coming from those countries was entitled to free entry, even though the balance of trade, in coal, was favorable to them, so long as coal was admitted duty free from any other country. These representations resulted in correspondence between the State and Treasury Departments, and Secretary of the Treasury Mills eventually made formal ruling that the contention was sound.

Later, however, this ruling was revoked and collectors of customs were directed by another formal ruling to assess duty upon coal coming from such countries as had a favorable balance of coal trade with the United States during the preceding calendar year.



## THE MAN ON THE FLYING TRAPEZE



—Washington Post

Importations made in 1932, from Germany, by Domestic Fuel Corporation, and from Wales, a part of the United Kingdom of Great Britain and Ireland, by Geo. E. Warren Corporation, were so assessed. The duties were paid under protest and the importers brought suit in the United States Customs Court to recover the duties so paid, the claim relied upon being that by reason of the inclusion of the language "unless treaties of the United States otherwise provide" in the Revenue Act, Congress evidenced its intent of recognizing and continuing in full force and effect the "most-favored-nation" sections of the treaties which the United States have had with other countries. The records of the two cases were consolidated and the appeals heard together.

Importers' contentions were sustained by the United States Customs Court and patent appeals, whose opinion affirms said judgment.

## Copper

**C**OPPER producers have finally agreed upon a code, and it is anticipated, will shortly function thereunder.

As finally agreed upon the code is as follows:

Approval of a code of fair competition for the copper industry, probably solving one of the most difficult problems which has faced the Administration and climaxing nearly seven months of almost continuous negotiations, was announced today by National Recovery Administrator Hugh S. Johnson. The code will become effective on April 26.

Under the administrator's order of approval, the very general production and sales program proposed by the industry when it was unable to agree on a detailed scheme, is replaced in the code by a definite sales plan designed to conserve copper resources, insure orderly liquidation of excessive stocks now above ground and at the same time provide for as much reemployment in the industry as possible.

An important feature is the provision establishing copper produced and sold under code conditions as "Blue Eagle Copper"—and as such the only copper which can qualify as complying with recent Presidential executive orders prescribing the use in government contracts of only products produced in compliance with approved codes or the President's Reemployment Agreement.

The code establishes a 40-hour maximum work week, averaged over a three-month period, throughout the industry with exceptions for employees engaged in emergency maintenance or emergency repair work, outside salesmen, managerial, executive, technical, engineering or supervisory employees receiving over \$35 weekly, and hoistmen, powerhousemen and pumpmen.

Minimum wages for the various districts in the industry are established as follows:

	Per Hour
(a) Great Lakes Wage District—	
Surface labor .....	32½c
Underground labor .....	37½c
(b) Northeastern Wage District—	
Surface labor .....	37½c
(c) Southeastern Wage District—	
Surface labor .....	35c
(d) Southwestern Wage District—	
Surface labor .....	30c
Underground labor .....	45c
(e) Northwestern Wage District—	
Surface labor .....	40c
Underground labor .....	47½c

Exceptions to the above schedules are that minimum wage rates in effect in any district on March 1, 1934 above those now specified for that district shall in no case be reduced and that the underground rate in the Ray District of Arizona shall be not less than 38 cents an hour.

Clerical and office employees as well as sales or service employees are to receive not less than \$18 weekly.

In his letter to President Roosevelt, reporting approval of the code, Administrator Johnson pointed out that the industry faces a situation in which if all the copper mines in the country were to be shut completely down for 18 months the available stocks of the metal now above ground would be ample to supply all estimated needs for the period.

Additional disturbing factors are greatly reduced consumption and the development of large copper deposits in Africa which with that already produced in Canada and South America is produced at low labor costs that American producers cannot meet.

"The industry," the Administrator reported to the President, "faces with these problems of excessive stocks, low consumption and a depressed price, has endeavored ever since the passage of the National Industrial Recovery Act, to work out a code that would offer a solution to their difficulties. The industry was unable to agree themselves on a plan and finally submitted a code covering only the labor, administrative, and mandatory provisions, with the permissive right to submit to the Administration at a later date a plan agreeable to all members to cover problems of production, sales and price.

"The National Recovery Administration felt, however, that in view of the necessity of maintaining employment, and to provide for an orderly recovery through regular purchases of copper and the freezing of immediate stocks, a plan

## THE MORNING AFTER



—Washington Post

should be provided and made effective immediately to accomplish this end.

"There is therefore, included in the administrative order of approval a plan which it is believed will accomplish this and the industry has indicated a willingness to cooperate in making this effective."

Under a plan written into the code by the administrator's order, an allocation of 20,500 tons a month with sales quotas for each primary producer in the industry, based on their relative annual productive capacities, are established as follows:

	Tons Per Annum	Monthly Percent. Sales Quotas
Kennecott Copper Corp. ....	366,500	1.67%
Anaconda Copper Mining Co. ....	225,000	1.67%
Phelps Dodge Corp. ....	168,000	1.67%
United Verde Copper Co. ....	68,000	1.90%
Calumet & Hecla Consolidated Copper Co. ....	50,000	2.20%
Miami Copper Co. ....	36,000	2.30%
Magna Copper Co. ....	25,000	2.50%
United Verde Extension Mining Co. ....	24,000	2.50%
Consolidated Copper Mines Co. ....	21,000	2.70%
Copper Range Co. ....	17,500	3.00%

In addition to the above 9,500 tons a month will be allocated to secondary producers by some equitable method to be determined by the code authority. Producers of custom and by-product copper may apply to the code authority for a sales quota and temporarily will have a quota of 50 percent of their current production.

To protect producers of copper who have no fabricating facilities and to distribute sales equitably a sales clearing agent is to be appointed and all sales of copper must be reported and cleared through this agent.

All users of copper are urged to enter into agreements with the code authority for the regular purchase of copper for their current needs and the fabricating units owned by members of the industry, have agreed to buy from 75 percent to 100 percent of their current needs from new production through the code author-

ity sales clearing agent rather than to draw upon stocks of copper now above ground.

The Administrator's order also provides that if at any time the selling price of copper reaches a level which in his judgment is unreasonably high, he may suspend any or all of the marketing provisions of the code. It also provides that if the anticipated consumption does not materialize and any producer accumulates one and one-third times his sales quota, the marketing plan will be terminated.

In his report to the President, the Administrator emphasized that "Copper is largely used in the capital or durable goods industry and any increase in consumption is dependent upon increased activity in these branches of industry."

"While it is impossible under present conditions," the report continued, "to provide for any but a slight increase in employment the code provisions will undoubtedly prevent the closing of mines now in operation, avoid destructive price-cutting, and at the same time provide adequate control of prices in the public interest."

"Copper is practically an indestructible metal," according to the report, "and nearly all the copper that has been mined is either in use or available for use. Refined copper is derived from two sources, primary or new copper produced from mining operations, and secondary copper resulting from the reprocessing of materials containing copper which is flowing back to the market in the form of junk or scrap. In recent years secondary copper has supplied about 20 percent (20%) of the total consumption. However, the flow of scrap back on the market is not in direct proportion to consumption and in the last year the percentage of scrap has been somewhat higher."

"Copper is mined in many states. The more important, and practically the only mines in operation are located in Arizona, Utah, Montana, Nevada, New Mexico and Michigan."

"The annual production capacity of domestic mines is approximately 1,000,000 tons of copper per year. To this must be added an estimated production of 125,000 tons of secondary copper. As of January 31, 1934, stocks of copper amounted to approximately 775,000 tons. Subtracting from these stocks, normal mill inventories and future sales commitments, there was approximately 450,000 tons of free stocks on hand."

"If the probable production of copper from scrap was added to the free stocks there would be 575,000 tons of copper on hand at the end of the next 12 months less actual consumption. With an estimated consumption of 400,000 tons per year, it is apparent that there is copper on hand or coming in the market from scrap to take care of domestic requirements for 18 months without any current mine production."

"In other words, if all the copper mines were to shut down for 18 months there would be sufficient copper available for all estimated needs during that period."

"The number of people employed in the industry averaged about 45,000 per year for the period from 1923 to 1929 inclusive. Since the latter date employment has gradually decreased. There were approximately 16,000 employees in 1933."

"A large number of those employed in

the industry live in communities built around the mines. In most cases there is no other type of employment available in the community. The falling off of employment has been felt very acutely and has resulted in great hardships, distress and suffering. It is imperative that current production be maintained at a rate equal to current consumption in order to keep as many as possible employed. To do this it is necessary to freeze a large part of the existing stocks and a plan is provided that should accomplish this."

"Another factor in the situation is the development of large copper deposits in Africa. The copper produced from this source together with Canadian and South American production is enough to care for world requirements. Due to low labor costs this foreign copper is produced at a price that this country has difficulty in meeting."

"The United States price of copper at refinery for the last 15 years has been as follows:

#### PRICES IN CENTS PER POUND

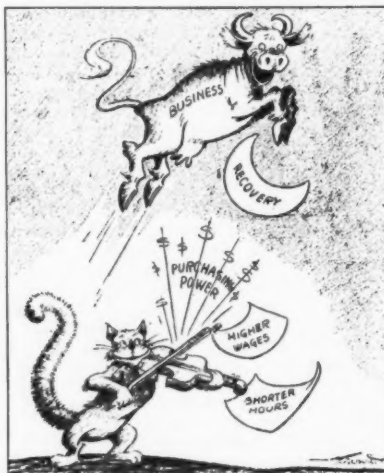
Year	High	Low	Yearly Average
1919.....	22.319	14.856	18.691
1920.....	18.918	13.188	17.456
1921.....	13.555	11.634	12.502
1922.....	14.074	12.567	13.382
1923.....	16.832	12.574	14.421
1924.....	14.260	12.327	13.024
1925.....	14.709	13.252	14.042
1926.....	14.174	13.302	13.795
1927.....	13.774	12.370	12.920
1928.....	15.844	13.823	14.570
1929.....	21.257	16.603	18.107
1930.....	17.775	9.597	12.982
1931.....	9.854	6.558	8.116
1932.....	7.060	4.813	5.555
1933.....	8.775	4.775	7.025

"Prior to 1919 the lowest average yearly price was 9.56 cents per pound in 1894. The normal price heretofore has been about 13 cents per pound."

"Copper has maintained a reasonable relation to the value of gold. The present market price in terms of gold is under five cents per pound."

"Improved equipment, mining, mill and smelting practices have gradually reduced the cost of producing copper but

#### SURE SHE CAN DO IT AGAIN



—Washington Daily News

the present average cost including reasonable depletion is in excess of the present selling price."

#### Gold and Silver

THE silver bill just reported out by the Senate Agriculture Committee (H. R. 7581) combines the provisions of the Dies bill, the Wheeler purchase plan and the "nationalization" of silver as conceived by Senator Thomas of Oklahoma, who is author of the measure. The Act follows, in part: To authorize a board composed of the President, the Secretary of the Treasury, the Secretary of Commerce, and the Secretary of Agriculture to negotiate with foreign buyers with the view of selling American surplus products at the world market price and to accept in payment therefor silver coin or bullion at such value as may be agreed upon which shall not exceed 25 per centum above the world market price of silver, and to authorize the Secretary of the Treasury to issue silver certificates based upon the agreed value of such silver bullion or coin in payment for the products sold, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That for the purpose of exchanging American agricultural surpluses for silver bullion and coin, and for the purpose of properly protecting and promoting international and domestic trade and commerce and promoting the general welfare, the Secretary of the Treasury and the Export-Import Bank of Washington (hereinafter referred to as the "bank") are authorized to acquire and purchase silver in the manner hereinafter provided.

Sec. 2. The bank is hereby authorized and directed to negotiate with foreign buyers with the view of selling American agricultural surpluses produced in the United States at the world market price to be paid for by said foreign buyers in silver coin or bullion at such value per ounce as may be agreed upon by the bank and said foreign buyers: Provided, however, That the bank shall in no event agree to accept silver bullion or coin at a price in excess of 25 per centum above the world market price of silver: Provided further, That such price (including the amount of the world market price plus any excess) shall at no time exceed \$1.29 per ounce. The bank is authorized to enter into option contracts with foreign buyers to deliver to them agricultural surplus products at the world market price and accept in payment for same silver bullion or coin at such value per fine ounce as may be agreed upon and which shall not exceed 25 per centum above the world market price of silver.

Sec. 3. The bank is further authorized to purchase such agricultural surplus products as may be deemed necessary to fulfill option contracts with foreign buyers or to make deliveries to foreign buyers for the purpose of carrying out this Act. The bank is authorized to employ any governmental agency of the Agriculture Department in securing the amount of agricultural surplus products necessary to make such deliveries, and to enter into contracts with the producers of such products as may be necessary for the purpose of carrying out the purposes of this Act.

Sec. 4. The bank is authorized and directed to deposit the silver bullion or



coin received in exchange for the said products sold to foreign buyers with the Secretary of the Treasury, and the Secretary of the Treasury shall immediately cause to be issued, against such silver bullion or coin, silver certificates based upon a value of \$1.29 per fine ounce. The silver certificates so issued shall insofar as necessary be used by the bank to pay for the agricultural products sold to foreign buyers under the provisions of this Act.

Sec. 5. The bank is hereby directed to authorize the Farmers' Cooperative Marketing Associations and other marketing agencies to enter into contracts for the sale of American agricultural surplus products in exchange for silver bullion or coin at such value per ounce as the bank shall determine and the same provisions in reference to the issuance of silver certificates and the limitation as to the amount at which the silver coin or bullion shall be valued as above set forth in preceding section hereof shall apply to this section.

Sec. 6. The Secretary of the Treasury is authorized and directed to accept any deposits of silver in the Treasury of the United States which such Secretary, subject to regulations prescribed by the bank, is satisfied have been imported into the United States in payment for agricultural surplus products sold and delivered, or to be delivered, to foreign buyers for exportation at a price which shall from time to time be determined by the said bank: Provided, however, That the price per ounce for such silver shall not be less than 10 per centum above the world market price of silver and not in excess of 25 per centum above the world market price of silver: Provided further, That such price (including the amount of the world price plus any excess) shall at no time exceed \$1.29 per ounce. The Secretary of the Treasury is further authorized and directed to issue for the account of the Treasury, against the silver so deposited, silver certificates based upon a value of \$1.29 per fine ounce, and deliver same to the owner of such silver who tenders same to the Secretary of the Treasury under the provisions of this Act. . . .

Sec. 11. . . . the Secretary of the Treasury is hereby authorized and directed to purchase silver bullion at the rate of not less than fifty million ounces per month, wherever silver shall be procurable, at a price to be fixed by him from time to time as provided herein, and the silver so purchased shall be paid for, held and deposited as provided in this Act.

## Lead and Zinc

THE sixteenth annual meeting of the American Zinc Institute will be held at the Hotel Statler, St. Louis, Mo., on Monday, April 30, and Tuesday, May 1, 1934. Matters of much importance to the zinc industry will be discussed. The following program has been announced: Address of welcome with response, H. S. Wardner, New Jersey Zinc Co.; Review of World Zinc Conditions, Oliver Roskill, London, England; Development of the Zinc Code, J. D. Conover, secretary, American Zinc Institute, Inc.; Organization of the Zinc Institute and Its Relation to the Proposed Code, R. M. Roosevelt, president, American Zinc Institute, Inc.

Progress Reports on the Better Galvanizing Campaign, by the Institute's

Tri-State Zinc and Lead Ore Producers Association's Bulletin for week ending April 14, 1934, gives the following data:

	ZINC CONCENTRATES			LEAD CONCENTRATES		
	This Week	Last Week	Year Ago	This Week	Last Week	Year Ago
Total stock (sold and unsold) . . . . .	14,182	13,850	23,703	11,901	11,834	16,335
Net reserve stock . . . . .	12,132	11,135	23,124	11,617	11,478	16,180
Production (*) . . . . .	5,887	6,106	1,244	699	969	176
Shipments . . . . .	5,555	5,981	3,232	632	1,353	148
Sales reported . . . . .	4,890	7,130	2,921	560	1,440	285
(*) Included tailing mill production . . . . .	1,533	1,437	136			
Base price—Joplin . . . . .	\$30.00	\$28.00	\$20.00	\$47.50	\$42.50	\$35.00
Metal price—Average for week						
Zinc, E. St. L.—Lead, St. L. . . . .	4.400c	4.310c	3.100c	4.070c	3.900c	3.075c

### Mill Statistics:

	This Week	Last Week
Mine mills operated 32 hours or more . . . . .	24	26
Mine mills operated less than 32 hours . . . . .	3	2
Tailing mills operated 96 hours or more . . . . .	20	16
Tailing mills operated less than 96 hours . . . . .	0	2
Total mills which produced more than 25 tons during week . . . . .	47	46
Mills which produced less than 25 tons during week . . . . .	11	8
Total number of mills operated during week . . . . .	58	54

Mine Mills Operated This Week: Amer. Diamond; Adm. No. 2 and No. 3; Barnsdall; Mary M. Beck; Beck No. 3; Mary Jane; Black Eagle; Canadian; Conico; V.H. Barr; Century Good Eagle; Turtle (formerly Dorothy Bill); Dines Wilson; EP Central; John L.; EW No. 4; Federal Jarrett; Bluebonnet; K&O Discard; Lucky OK; Lost Trail; Lawyers; Massel; Mid-Continent; Mission; Ramage; Redskin; Skelton; St. Louis No. 4 and No. 8; Triple P; UZ Royal; Velie Lion; White-McKay; Zig Zag.

Tailing Mills Operated This Week: Atlas; Aul; F&B Bluebird; Cardin; CM&R Beaver; Chubb & Wober; King Brand; EW No. 7; Peru-Laclede; Goings & Co.; Myers No. 2; Hutts; Interstate Woodchuck; Joplin Ore Milling; Jay Hawk; Pioneer; Prairie Chicken; Semple; Mo. Chitwood; Tri-State Ottawa; Youngman.

staff: The "Seal of Quality" Campaign in the Field, Charles Matthews, field representative; Getting the Facts about Zinc Coatings, G. C. Bartells, technical representative; Pushing a Good Thing Along, K. J. T. Ekblaw, agricultural engineer; Consolidating the "Seal of Quality" Campaign, J. D. Conover, secretary. The Steel Man's Viewpoint of Better Galvanizing, J. L. Schueler, Continental Steel Corporation; The Consumer's Interest in Better Galvanizing, Prof. H. W. Riley, New York State College of Agriculture.

Review of Zinc Mining Conditions: Washington, L. P. Larsen, Pend Oreille Mines and Metals Company; Idaho, D. A. Callahan, Callahan Zinc-Lead Company; Montana, W. B. Daly, Anaconda Copper Mining Company; Nevada, Utah, Colorado, E. H. Snyder, Combined Metals Reduction Co.; New Mexico, Arizona, E. H. Wells, New Mexico School of Mines; Oklahoma, Kansas, Missouri, M. D. Harbaugh, Tri-State Zinc and Lead Ore Producers Association; Wisconsin, R. B. Keating, Vinegar Hill Zinc Company; Tennessee, M. H. Newman, American Zinc, Lead and Smelting Company; Virginia, New Jersey, R. B. Paul, New Jersey Zinc Company; New York, C. R. Ince, St. Joseph Lead Company; Manitoba, R. E. Phelan, Hudson Bay Mining & Smelting Company; British Columbia, S. G. Blaylock, Consolidated Mining & Smelting Co.

TO SUPPLY the mineral industry promptly with data on rolled zinc production and markets during the past year, the following information is furnished by the United States Bureau of Mines.

The output of rolled zinc (sheet zinc, boiler plate and strip zinc) in the United States in 1933 was 41,261 tons, valued at \$6,055,000, compared with 39,731 tons, valued at \$5,029,000, in 1932. Thus, the production was 4 percent higher and the

value 20 percent higher in 1933 than in 1932. In addition to the quantities given, scrap originating in fabricating plants operated in conjunction with zinc-rolling mills was rerolled and produced therefrom amounted to 6,342 tons in 1933, and 8,066 tons in 1932.

Zinc used in rolling was made up of the following grades: Brass special, 56 percent; prime western, 16 percent; high-grade spelter, 15 percent; intermediate, 10 percent; and electrolytic, 3 percent.

## Tungsten Industry in 1933

THE tungsten mining industry made a substantial recovery in 1933, the quantity of domestic ore shipped being equivalent to the average shipments for the 5-year period 1928-1932.

In 1933, 895 short tons of concentrated tungsten ore (reduced to an equivalent of 60 percent WO<sub>3</sub>) produced in the United States, were sold, compared with 396 short tons in 1932. The average value per unit of the tungsten concentrates sold increased from \$9.20 in 1932 to \$9.58 in 1933. Shipments of tungsten concentrates were made from Arizona, California, Colorado, Nevada, and Washington, in quantities ranging from 43 short tons in Arizona to 550 short tons in Nevada.

The shipments of tungsten concentrates in the United States during the past 5 years are shown in the following table:

Concentrated tungsten ores (reduced to an equivalent of 60 percent WO <sub>3</sub> ) produced in the United States, sold in 1929-33, and average price per unit:			
Year	Short tons	Value	Average price per unit
1929 . . . . .	830	\$654,000	\$13.13
1930 . . . . .	702	509,000	12.89
1931 . . . . .	1,404	928,000	11.02
1932 . . . . .	396	218,394	9.20
1933 . . . . .	895	514,234	9.58

## Efficient Coal Mine Haulage

(Continued from page 50)

A good portion of the wrecks occur from defective mine cars, flat or broken wheels, loose body irons, bad brakes, etc. It is still the common custom for the motorman or brakeman to write on the car in chalk, "Bad Order," and if he thinks of it, he puts it on the shop track where the car repairman looks it over, makes what he thinks are the necessary repairs, and the car is put back in service. So much effort is lost when handled in such a loose manner. The brakeman or motorman should be required to see what is wrong with the car, then report it to the dispatcher, identifying it by number; then the dispatcher can notify the repairman what is wrong with the car and the car repairman's record will show when the condition complained of was corrected. The numbered car becomes an individual and if it does not show up at the tippie in regular turn with the others, then find out why. When a numbered car is placed at the working face the coal loader and the section foreman know if they allow it to be caught under a fall, it will be missed; knowing this, they have an added sense of responsibility, and few, if any, mine cars are lost.

I realize there are some who consider this is going too far and a foolish idea, but conditions are changing and our ideas must change also. You must know every unit of your transportation system thoroughly if your operations are to be successful.

As far as mining conditions will permit, transportation should be given preference in the plan of mining. The working places should be cut with reference to the nearest width that permits a full day's loading. Sharp curves and bad grades should be avoided. Usually there is some way to get around a bad grade. Timber and other supplies should be so handled that they will be delivered at a time best suited to the loader and at a time when the haulage system can best handle them.

Various systems of haulage are applicable to the average mine and there are on the market today excellent and reliable signal devices. Whatever the system, it will not function without supervision, daily supervision. Too much dependence cannot be placed on any mechanical device, no matter how well constructed. Keep your locomotives moving; keep your locomotives under the dispatcher constantly. Make the motorman or the brakeman repeat orders to the dispatcher so there can be no misunderstanding. Maintain your track, your locomotives and the mine cars. Don't wait for something to happen. Give transportation the thought and study it is entitled to and the shorter working day and shorter working week will not affect you.

A. G. MACKENZIE, secretary of the Utah Chapter of the American Mining Congress, and Mrs. Mackenzie are at the Mayflower Hotel, Washington, for a several weeks' visit.

## Mine Timber

At the hearing on the Lumber Code before Deputy Administrator R. A. Selfridge in Washington, on April 2nd, the American Mining Congress protested the wording of Item 4, Paragraph (a) and (b) Section 3, Chapter II under Schedule B of the Code as presented by the Lumber Code Authority. The item as proposed by the Code Authorities under "Recognized Wholesale Trade for Soft Woods (and also Hard Woods)" is defined as "a sale of lumber and timber products in carload quantities or more to: (4) for ship yards, underground work in mines, docks, dams and bridges."

The American Mining Congress, speaking for the mining industries of the United States asks that the expression "underground work in mines" be changed to read "mine properties," for the reason that it is customary at all times to order lumber and timber products for mining properties in not less than carload lots and to draw from the stocks kept at the mine properties for whatever need may arise for these products. The majority of mining properties are remote from retail yards and stocks of lumber and timber products must necessarily at all times be on hand. Such a practice has been established by custom and necessity through the many years of operation of mining properties and it is unthinkable that it should be disturbed.

## Accident Record of the Phelps Dodge Corporation

(Continued from page 55)

The safety program of the corporation contains nothing new in practice or methods. We have not resorted to the emotional or revival meeting type of appeal in educational measures. At the beginning of the present campaign, interest was stimulated quite largely through competitive and publicity methods. Safety bonus payments have not been used in recent years as a means of stimulating interest, and safety work is handled in the same routine manner as are other operating problems.

The results obtained in the past nine years of intensive work demonstrate very clearly that all types of mining can be done in a safe manner, provided the safety program is based on those principles which are now generally recognized as essential to effective accident prevention work.

<sup>1</sup> Secretary's Report—D. Harrington. Transactions of the National Safety Council, Mining Section, 1931.

<sup>2</sup> "Some Fundamental Requirements in Successful Accident Prevention Work" by P. G. Beckett. Transactions of the National Safety Council, Mining Section, 1930.

"Safety Organizations in Arizona Copper Mines," by E. D. Gardner and B. J. Parker. Bureau of Mines Technical Paper 452.

"Accident Prevention Work at the Phelps Dodge Corporation," by H. C. Henrie. The Mining Congress Journal, July, 1931.

"Fundamental Steps in Safety, by Engineering Staff, Stag Canon Branch, Phelps Dodge Corporation." The Explosives Engineer, November, 1932.

A FEATURE of recent mining technique on the South Yorkshire coal field has been the rapidity with which a change-over has taken place from hand to machine mining as the standard method of working. Yorkshire for a long time has lagged behind the rest of the coal fields in the application of machinery to the coal face, but is now rapidly recovering its arrears and in the field of rapid opening out has taken the lead. At the East and Beighton pits of the Sheffield Coal Co. the policy of applying machinery to the driving of headings in the solid as a method of greatly increasing the rate of advance and at the same time reducing the cost has been strikingly vindicated.

In the Parkgate seam at Beighton pit a 12-ft. heading has been advanced 321 yd. in 15 working days made up of three weeks of five days, working three shifts per day. Six men comprise the team for working the heading and are paid on a yardage basis, and the equipment consists of the following machines:

(1) Undercutting and shearing is done by an Anderson Boyes Universal heading machine. This machine is mounted on caterpillar tractors. The undercutting is done in the band of dirt 1 ft. 9 in. from the floor of the seam to a depth of 6 ft., and two shearing cuts are made.

(2) The mechanical loader, manufactured by Messrs. Mavor and Coulson, of Glasgow, has a loading capacity of 1½ tons per min. It is mounted on self-propelling caterpillar tractors with a fitting speed of 170 ft. per min.

(3) The loader delivers to a shaker conveyor. The first section of this conveyor is specially designed and may be rapidly extended to follow the loader.

(4) The shaking conveyor delivers to a belt conveyor with a specially prepared loading station, served by an endless rope haulage for handling of tubs.

(5) Shotholes are bored by a Siemens-Schuckert rotary electric drill fed by a transformer stepping down the voltage to 125.

(6) The heading is ventilated by an electric fan situated at the out-by end, delivering 1,250 cu. ft. of air per min. against a w.g. of 10 in. The pipes are of welded steel ½ in. thick and 10-in. diameter, in 12-ft. lengths with flanged joints, secured by four bolts.

(7) Two 100-watt lamps are used for illuminating the face of the heading and are fed from the drill transformer.

NATIONAL BITUMINOUS COAL Code Authority of NRA of Iowa, Indiana and Illinois protests against power features of Missouri Valley project and Arkansas River project, proposed in Congress, saying in letter to members of Senate and House that areas included in the projects are adequately supplied with power from steam plants using coal as fuel.

# HAVE YOU HEARD—?

PUBLIC WORKS ADMINISTRATION FUNDS were used to employ more than four and one half million persons between July, 1933, and February, 1934.

THE SPECIAL COMMITTEE set up by Miss Perkins, Secretary of Labor, to investigate anthracite conditions, has recommended to the Department the shortening of the work week to 32 hours. The committee was composed of Dr. Carter Goodrich, Columbia University economist; Hugh S. Hanna of the Labor Department, and David J. Price of the United States Bureau of Mines, recommended "that the anthracite code empower the code authorities to require distribution of work between miners in the same area so that more miners might be given work during periods of idleness."

EXPORTS OF WHISKY, gin and other spirits to the United States from Great Britain in the first quarter of this year totaled 814,638 gallons, valued at \$1,170,613.

L. S. CATES, president, Phelps Dodge Corporation, anticipates good buying of copper as soon as the code for the industry becomes effective. He believes the code will stimulate the industry, which should bring about 9-cent copper within the next year.

ACCORDING TO PRESS DISPATCHES, the British have designed a plant to produce 100,000 tons of oil annually by hydrogenation of bituminous coal. Capital expenditure on the plant will exceed two and a half million pounds, and will employ directly and indirectly 13,600 men.

ACCORDING TO A REPORT by Secretary of Labor Perkins, continued gains in employment and payrolls in private industries are evident. She estimates that employment has now reached the highest point since December, 1930, and payrolls have reached the highest level since August, 1931. Miss Perkins estimates that 2,750,000 workers have been returned to employment since March, 1933, and that weekly wages have been increased \$79,000,000.

AT THE CONFERENCE on America's public ownership program, Dr. Colston E. Warne, of Amherst College, said: "Our basic industries must be coordinated under social ownership and operation if permanent recovery is to be had. We have too long ignored the lesson of the spectacular accomplishments in the Soviet Union. To buy out the present owners by giving them Government bonds for their highly inflated securities is but to perpetuate the maldistribution of wealth and to guarantee that the Government will continue to operate in the interest of property holders. Instead we imperatively need a new social structure."

NATIONAL BITUMINOUS COAL Code Authority of NRA of Iowa, Indiana and Illinois protests against power features of Missouri Valley project and Arkansas River project, proposed in Congress, saying in letter to members of Senate and House that areas included in the projects are adequately supplied with power from steam plants using coal as fuel.

ACCORDING to representatives of the men involved, a strike of approximately 325,000 bituminous coal miners in the Appalachian region will be called April 1 unless a new contract is given this group by the mine operators.

FOR THE FOUR YEARS 1928 to 1931 inclusive our exports of anthracite, bituminous and coke averaged in value about \$90,000,000 per year. This business largely results from established outlets created by American firms and American interests abroad. This and more of this export business in coal is certainly needed for the benefit of the coal regions.

IN GIVING her approval of the Wagner-Lewis unemployment insurance bill to the House Ways and Means subcommittee concerning this legislation, Secretary Perkins testified that the 5 percent excise tax on the total annual payroll of industrial employers which the bill provides is "both profitable and fair." Miss Perkins estimates that such a tax would produce revenues of \$1,000,000,000 a year.

CHAS. H. SEGERSTROM, managing director of the Carson Hill Gold Mining Corporation, stated in regard to open-pit mining on the Mother Lode of California that in most cases the ore could be mined and milled for not to exceed \$1 a ton. His company's experiments with steam shovels proved successful, and by this method it is working the Santa Cruz claim, where an ore body approximately 2,000 ft. long and averaging 30 ft. wide is available. The waste from the sides is being stripped and put over the dump, while the ore is being handled by the steam shovel and trucks and put into the mill at a very low cost. It is stated that the company can handle about 300 tons a day with its existing equipment. The Carson Hill mine resumed work on Labor Day last year, and the mill was placed in operation shortly thereafter, following one of the largest construction and rehabilitation programs of the year. Production has been gradually stepped up, and operating costs have shown a gradual decrease. According to monthly figures, 10,000 tons were mined and milled in October; 12,000 tons in November; and 14,000 tons in December. Operating costs in October were \$2.06 per ton of ore milled; \$1.86 per ton in November; and \$1.62 per ton in December. Operating costs of less than \$1.50 a ton are expected to be attained on full production of the plant, considered to have a capacity of around 700 tons of ore daily.

THE CITY OF BALTIMORE has been widely advertised throughout the Nation as "A Town With Money in the Bank." The year 1933 was closed with a municipal budget surplus of more than \$950,000, and with approximately \$3,000,000 cash in bank. The tax rate for 1934 was reduced by 20 cents on the \$100, and additional relief was given taxpayers by a reduction in the taxable basis over a three-year period of approximately \$365,000,000.

HIGHWAY IMPROVEMENT has been at the rate of approximately 15,000 miles of hard-surfaced roads, annually in recent years. It is estimated that an annual highway program of over 100,000 miles is justified if we are to have an adequate national transportation system.



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# NEWS OF MANUFACTURERS

**THE ROBINS CONVEYING BELT COMPANY** has appointed two new sales agencies—one in charge of MR. FRED BATHKE, 1957 University Place, St. Paul, Minn., who will handle Robins' products and services in the state of Minnesota, the western part of Wisconsin and the northwestern corner of Michigan; the other in charge of MR. RAYMOND CHURCH, Box 114, Pleasant Ridge Station, Cincinnati, whose territory will include the southwestern part of Ohio and Southeastern part of Indiana, and the western part of Kentucky.

**THE CATERPILLAR TRACTOR COMPANY**, of Peoria, Ill., announces its new Twenty-Two Tractor.

The new model is powered with a four-cylinder, four-cycle, valve-in-head engine developed especially for converting a wide range of low volatility fuels into efficient, dependable tractor performance. The engine has a 4-inch bore and 5-inch stroke and develops a maximum horsepower of 23.69 at the drawbar and 28.39 on the belt at governed speed of 1,250 r.p.m. Lubrication is force feed to all main, connecting rod and rocker arm bearings. A twin fuel tank holds 20 gallons of tractor fuel and 2 gallons of gasoline, which is used in starting, and a 3-way fuel control valve is located on the dash in easy reach of the operator.

The Twenty-Two is available in either standard or wide gauge models.

**THE ROBINS CONVEYING BELT COMPANY** has acquired from the T. M. Chance Estate the sole sales, engineering and construction rights in the United States and Alaska to the famous Chance Sand Flotation Process for cleaning bituminous coal.

**A SELF-ADJUSTING**, positive variable speed transmission for fractional horsepower duty, known as the Link-Belt V. R. D. (Variable Roller Drive), is being announced by Link-Belt Company, Philadelphia, Chicago.



The V. R. D., which is capable of a horsepower output of  $\frac{1}{2}$  H. P. at maximum speed, with a maximum ratio of speed variation of 10 to 1, continues such features as compact all-metal construction; total enclosure; self-lubrication in an oil bath; protection from moisture and grit; and the use of a chain for transmitting the power positively.

**M. R. BATT L. SPAIN**, for the past 24 years with the General Electric Company at West Lynn works as manager of turbo-blower sales, is now connected with Ingersoll-Rand Company as manager of the turbo-blower department. He will be located at the general offices, 11 Broadway, New York.

The occasion for the transfer of Mr. Spain is the acquisition of the turbo-blower business of General Electric by Ingersoll-Rand Company.

**THE TIMKEN ROLLER BEARING COMPANY** and the Timken Roller Bearing Service and Sales Company, Pittsburgh district office, are now located at 414-416 North Craig Street.

**THE GENERAL ENGINEERING COMPANY, INC.**, metallurgical engineers, of Salt Lake City, announce that their New York office has been moved from 50 Broad Street, to 30 Church Street, New York City . . . Mr. E. S. Tompkins becoming their Eastern representative."

**CONTINUATION** of the scientific exhibits presented by Union Carbide and Carbon Corporation at the World's Fair was assured this week with the announcement that contracts for exhibit space had been signed. In keeping with the progressive nature of A Century of Progress numerous changes have been planned to make the U. C. C. exhibit a still more popular "center of interest" of the Hall of Science.

In cooperation with A Century of Progress, the popular basic Science Exhibits—"Story of Air" and "Story of the Electric Furnace" will again be portrayed. The "Liquid Air Demonstrations" which played to capacity audiences all last summer are to be repeated.

The principal units of Union Carbide and Carbon Corporation whose products and activities will be displayed in the Applied Science Division include National Carbon Company, Inc., The Linde Air Products Company, Union Carbide Company, The Prest-O-Lite Company, Inc., Carbide and Carbon Chemicals Corporation, Oxweld Acetylene Company, Acheson Graphite Corporation, Electro Metallurgical Company, Haynes Stellite Company, and Union Carbide and Carbon Research Laboratories, Inc.



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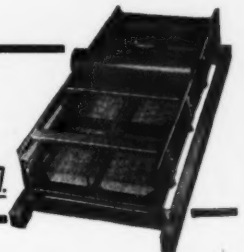
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RACINE - WISCONSIN





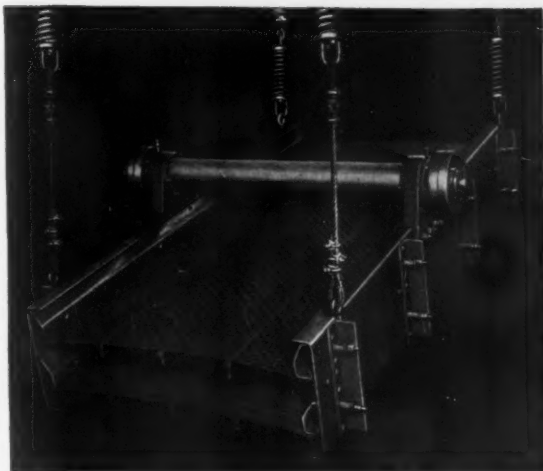
# Two Types of Screens

## Which do you need in your plant?

ALLIS-CHALMERS vibrating screens are available in two types . . . in sizes suitable for every plant. They are used for sizing crushed stone, slag, ore, sand and gravel, coal and coke, wood chips, commercial fertilizer, in fact, nearly all kinds of materials sized for commercial purposes, either wet or dry.

### Aero-Vibe Screens

The "Aero-Vibe" screen "floats in the air" suspended from the supporting structure by cables and springs. A rapid, adjustable, vibrating motion is produced by counter-weighted wheels mounted on the drive shaft supported in anti-friction bearings above the screen body or vibrating member. Single and double deck "Aero-Vibe" screens are available from 1½ x 3 ft. to 4 x 10 ft. sizes for handling medium to fine size materials, and for limited tonnage.



Aero-Vibe Screens

### Centrifugal Vibrating Screens

Style "B" Centrifugal screens are built with one, two, or three decks in sizes from 2 x 6 ft. to 5 x 14 ft. and are adaptable for heavy loads and the maximum range of material size. The screening action, which is equally intense for all tonnages, is transmitted to the Screen body or vibrating mem-

ber by an eccentric shaft located above the screen and supported in anti-friction bearings. The screen body "floats" on balance springs reducing power and the load on the bearings; the entire screen is cable and spring suspended.



Style "B" Centrifugal Vibrating Screens



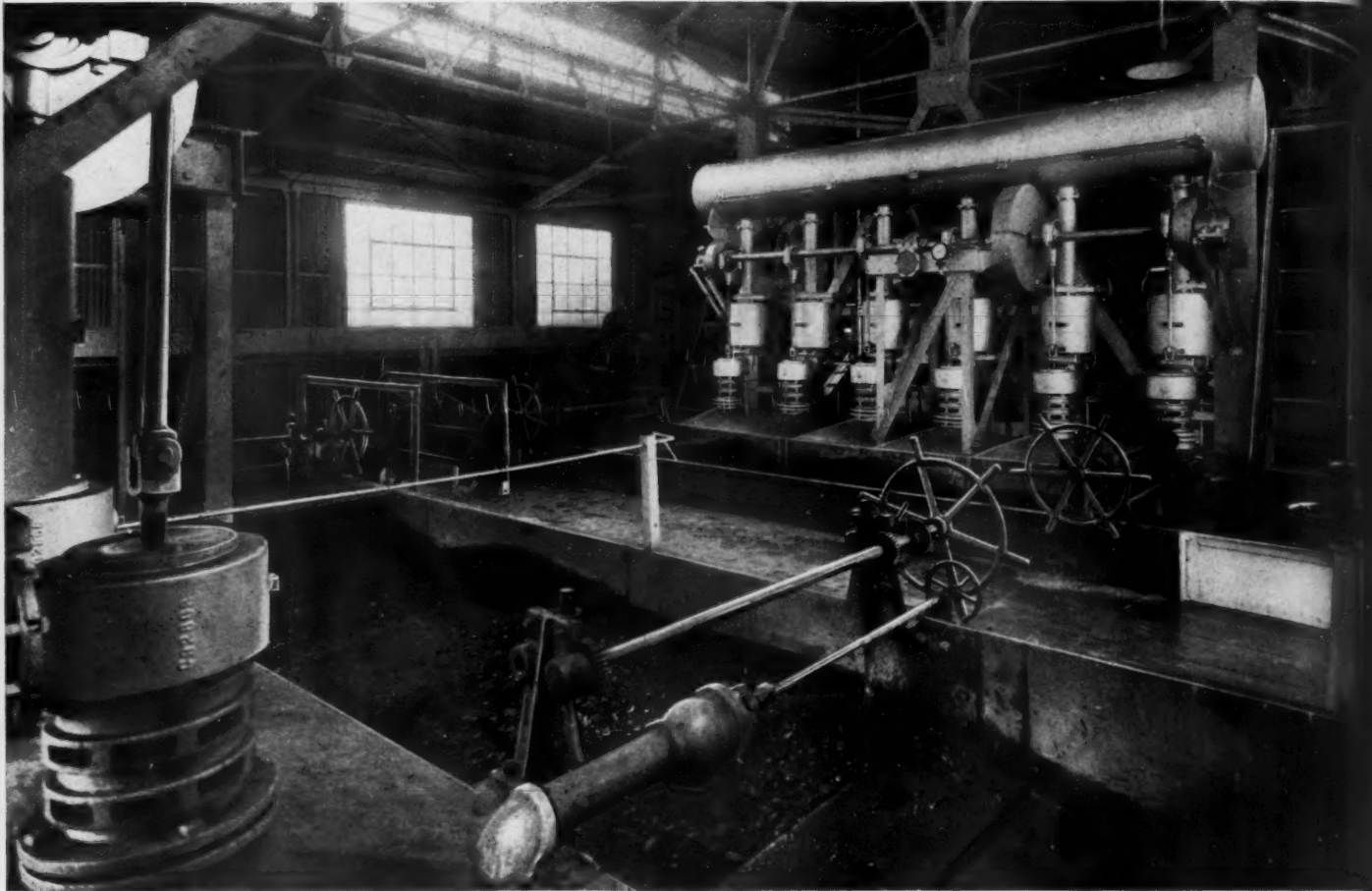
### Crushing Plant Equipment

- Gyratory Crushers
- McCully and Newhouse
- Non-Choking Concaves
- Jaw and Roll Crushers
- Revolving Screens
- Vibrating Screens
- Scrubbers and Washers
- Elevators and Pan Conveyors
- Feeders and Bin Gates
- Friction and Electric Hoists
- Grinding Machinery
- Cement Mill Machinery
- Mining Machinery
- Electric Motors
- Gearmotor Units
- Texrope V-Belt Drives
- Centrifugal Pumps
- Air Compressors
- Track-type Tractors
- Road Machinery
- Track-type Wagons
- Tunnel Shovels

# ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee —

# COAL CLEANING *by* LINK-BELT

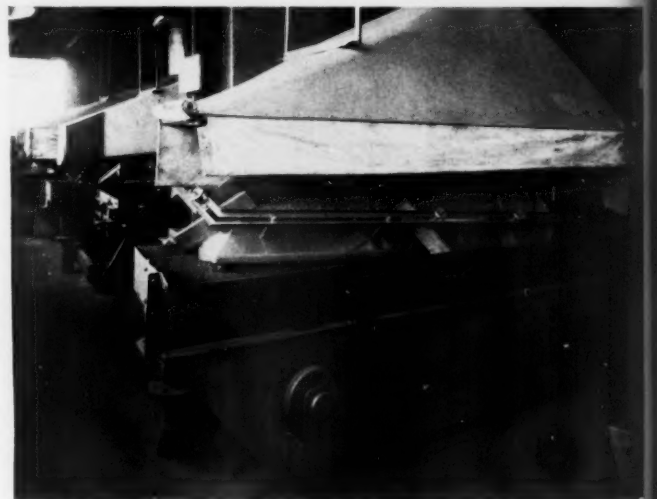


Link-Belt Simon-Carves washing system handling all coal from 4" to 0, at Midland Electric Coal Corporation, Farmington, Illinois. Twin units, each having a capacity of 200 tons per hour.

**T**HE Link-Belt Simon-Carves coal washing system has provided a new efficiency in coal cleaning. The 289 units put in service all over the world have demonstrated that it is low in capital outlay, depreciation, supervision, repairs, renewals and power consumption. It cleans coal thoroughly, and completely, with a minimum loss of yield.

The Link-Belt dry cleaning system employs new and sound principles in this form of cleaning. The dry table used is a tried-and-proved unit that has given exceptionally satisfactory service wherever installed.

Link-Belt prescribes either wet or dry cleaning, or both in combination, wherever they best apply.



Pneumatic concentrating tables for dry cleaning

## LINK-BELT COMPANY

300 W. Pershing Rd., Chicago

Philadelphia

Denver

Seattle

Pittsburgh

Wilkes-Barre

St. Louis

Huntington, W. Va.

Kansas City, Mo.

Toronto

See our Exhibit at the American Mining Congress Exposition, Cincinnati, May 7-11, 1934

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00 tons per hr



Toronto  
1, 1934